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THE AMERICAN NEPTUNE

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EDITOR'S NOTE

It has already begun. For four nights in October, many of us sat faithfully with our television sets tuned to our local PBS station (or faithfully programmed our VCRs to it) to watch "Columbus and the Age of Discovery." Many international magazines have featured cover stories in recent months on the explorer and his voyages, and the Pulitzer Prize-winning biography of Columbus by Samuel Eliot Morison (one of this journal's founders) has been reissued. Moreover, if one considers the numerous new biographies of the Genoese mariner and reinterpretations of his story that have emerged in the past year or two, the observance of the five hundredth anniversary of Columbus's discoveries began well before it recently caught the public eye.

Perhaps it is not surprising, given the importance of the event, that the celebration of the Columbian Quincentenary began a full year or more before the 12 October 1992 date. Nor is it unusual that planning for a variety of celebrations, here in the U.S. and abroad, began years ago. There will be major expositions in Genoa, Seville, Madrid, and Columbus, Ohio; replicas of the *Niña, Pinta,* and *Santa Maria* have travelled from Spain to the New World; tall ships will parade in numerous cities; national and local commissions have been hard at work worldwide, and "Christopher Columbus — the Movie" is scheduled for release on 4 July 1992.

What is somewhat surprising is the extent of controversy that has developed alongside plans for commemoration. For many people, Columbus's discovery of America is not something to be celebrated, but rather to be lamented. The naysayers have some legitimate complaints. It is undeniably true that, in the years following Columbus's voyages to the New World, its native inhabitants suffered disease, death, conquest and exploitation, and in some cases enslavement. All that was both good and bad about Western European culture was forced upon them, and those who survived became second class citizens to a dominant white, Christian, European ruling class. The beneficial exchanges of European and New World plants and animals do not balance the account.

We find ourselves caught between the two positions in the Columbian exchange. While we cannot deny that great harm has come to native American populations in the past five hundred years, neither can we adopt what has become the politically correct stance that Columbus's voyage to America was an event to be mourned. Instead, many of us admire the explorer, presumably because of our interest in maritime history.

To a maritime historian, Columbus's voyage is not only the beginning of a new era (whether of progress or decline is debatable), but the end of one — an era which began sometime after the year 1,000 A.D. and which witnessed the merging of Northern European and Mediterranean shipbuilding techniques and seafaring traditions. The new combination matched the carvel built, lateen rigged vessels of the Mediterranean and the clinker built, square rigged vessels of the Northern seas. The result was the full rigged ship capable of attempting and completing a voyage across the greatest known ocean. The most significant technological innovation of the Middle Ages was not the castle or the Gothic cathedral, it was the ship, and Columbus's voyage was the culmination of the process that produced such a ship. Regardless of what ensued, his voyage has to be admired as a triumph of maritime technology and human will.

There are other consequences of his achievement as well. Prior to Columbus's voyage, the Atlantic Ocean was one of the world's great barriers, keeping peoples and cultures permanently separated. Admittedly, others had preceded Columbus across the ocean. It was his voyage, however, which began the age of exploration that would transform the Atlantic and the other oceans of the world from barriers to highways — for exploration, information, commerce, and yes, for conquest. The ills of the latter, however real, cannot eclipse in importance the promise of the former. As maritime historians, we look at the world from the sea rather than from the land. In addition to nations and peoples, we see huge expanses of water waiting to be conquered by human ingenuity. Columbus conquered one of them.

I am certain that many more words about Columbus and his voyages, representing many viewpoints, will appear during the next year. Few students of history would deny that there is more than one way of looking at most any event. But we in maritime history like to say that "the seas are one," and before Columbus, they were many, and forbidding, and it is hard for us to criticize the fact that he changed all that. Perhaps Dr. Michael Gannon, Director of the Institute for Early Contact Period Studies at the University of Florida, put it best when he said to me that his organization might not celebrate the Columbian Quincentenary, but it would observe it. Can we do less?

TIMOTHY J. RUNYAN

Cleveland, Ohio

"On Good Fishing Ground But Too Early for Whales I Think":

The Impact of Greenland Right Whale Migration Patterns on Hunting Strategies in the Northern Whale Fishery, 1600-1900

CHESLEY W. SANGER

MODERN commercial whaling evolved through recurring cycles of exploitation and relocation. Each cycle began with discovery and hopeful enterprise, passed through rapid expansion, intense competition and exploitation, and ended in declining stocks and industrial failure (see Figure 1 on page 222). Discovery of new whaling grounds or introduction of innovative technologies could rejuvenate ailing industries, but further unregulated expansion, hunting, and stock depletion again caused decline and cessation. New technologies permitted harvesting of species not previously available under the limitations imposed by existing equipment, techniques and strategies, often initiating new fisheries with development and operational patterns similar to earlier phases.[1]

The Greenland Right whale, or Bowhead (*B. mysticetus*), was the second cetacean species to become the object of organized, large-scale whaling operations at Spitsbergen, within the Greenland Sea, and at Davis Strait/ Baffin Bay (see Figure 2 on page 223) — the area collectively referred to by European whalers as the Northern fishery. Like the Southern or Black Right whale (*B. glacialis*), the first species to be hunted commercially by Basques in the Bay of Biscay and off southern Labrador, the Greenland Right whale displayed all of the characteristics which, given the relatively primitive open-boat and hand-thrown harpoon technology available to the early whalers, made both species the "Right whales" to pursue.[2] They were slow-moving, gentle, did not sink when killed, and from an economic point of view, provided excellent yields of oil and whalebone.

The sixteenth-century Basque whale fishery at Labrador was on the wane by the early 1580s. Increasingly longer voyages were producing declining cargoes. It gave way after 1610 to an English/Dutch Arctic shore-based whale fishery at Spitsbergen from which the Basques were excluded. This phase of Northern whale fishing, in its turn affected by declining catches, evolved during the latter half of the seventeenth century into an offshore ice-edge operation in the Greenland Sea. By 1720, the industry had spread westward round Cape Farewell and incorporated both ice and strand whaling operations in Davis Strait and Baffin Bay. The English wrested control of the Northern trade away from the

The author wishes to thank A. Small, Department of Geography, University of Dundee, and W. G. Handcock, Department of Geography, Memorial University of Newfoundland, for advice and assistance. Particular thanks are due to C. Conway and G. McManus, Memorial University of Newfoundland Cartographic Laboratory, Department of Geography, for drawing the figures, and Sharon Wall for typing the manuscript. This research was funded by the Social Sciences and Humanities Research Council of Canada.

1. The "modern" era of commercial whaling dates from 1868, when the Norwegian Svend Foyn successfully used a harpoon-cannon mounted on the bow of a steam-powered catcher to kill whales in coastal waters off Norway, the carcasses being towed back to shore for subsequent processing. Modern whaling also required the development of exploding harpoons and winching apparatus capable of retrieving the bodies of whale species which usually sank when dead. Thus, the stocks of great whales — the "finners" — which had previously been immune to attack by whalers using traditional equipment and hunting methods, could now be harvested (see Figure 2 on page 223).

2. For a full discussion of Basque whaling operations within the Bay of Biscay and at Labrador, the evolution of Arctic whaling, and the development and diffusion of subsequent phases through to the present, see C. W. Sanger, "The Origins of the Scottish Northern Whale Fishery," (Ph.D. thesis, University of Dundee, 1985), pp. 42-182.

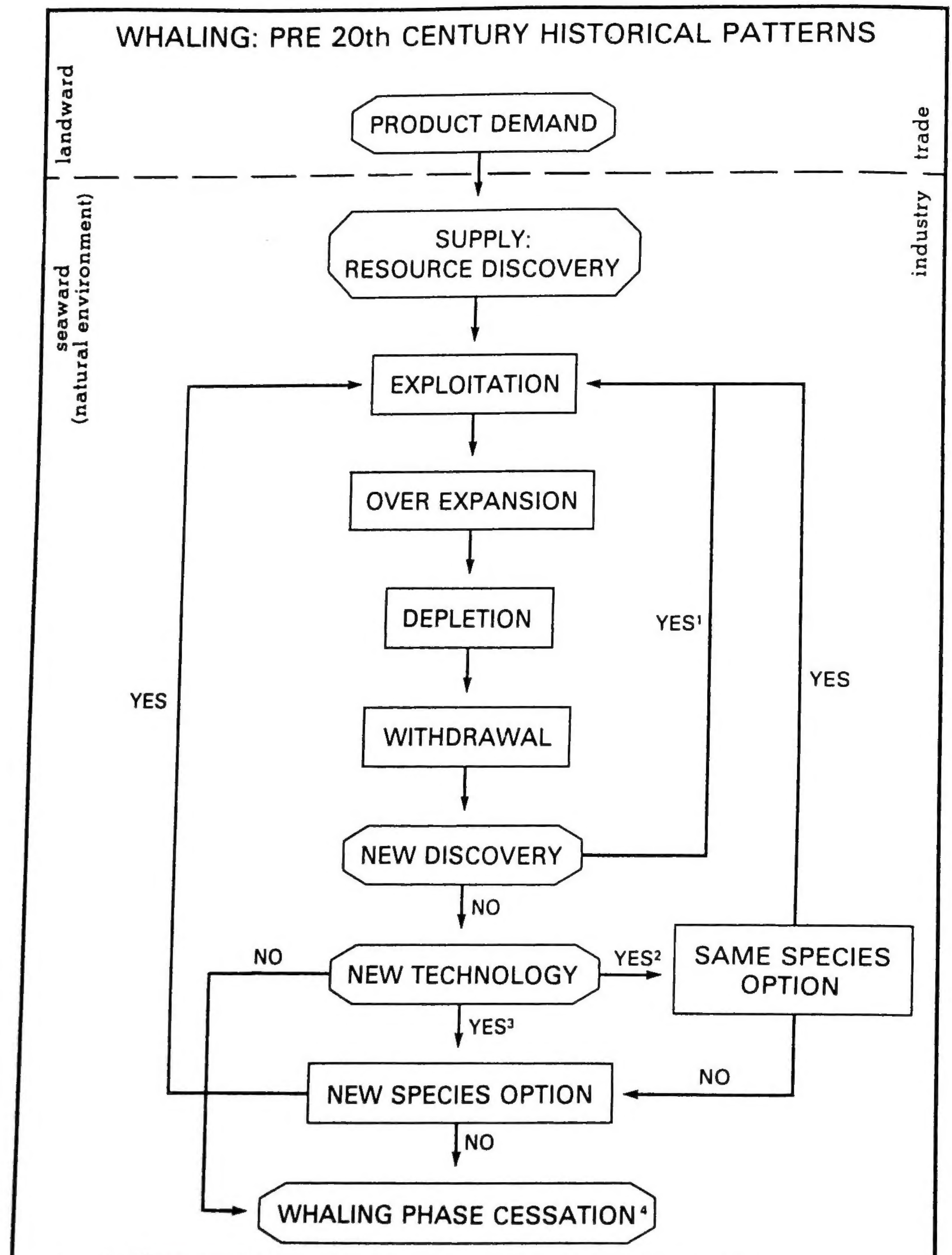

WHALING: PRE 20th CENTURY HISTORICAL PATTERNS
landward
seaward
(natural environment)
trade
industry
PRODUCT DEMAND
SUPPLY:
RESOURCE DISCOVERY
EXPLOITATION
OVER EXPANSION
DEPLETION
WITHDRAWAL
NEW DISCOVERY
NO
NEW TECHNOLOGY
NO
YES2
YES3
SAME SPECIES
OPTION
NEW SPECIES OPTION
NO
NO
WHALING PHASE CESSATION4
YES
YES1
YES
1 spatial diffusion same species or new species supplying same demands using existing technology
2 more effective and efficient technology permitting continued exploitation of declining resource stocks
3 capture of species previously not available before adoption of new technology
4 appropriate to pre-twentieth century whaling Although model does not incorporate resource management and conservational regulations which have influenced post World War One practices, similar patterns have characterized modern whaling

Figure 1

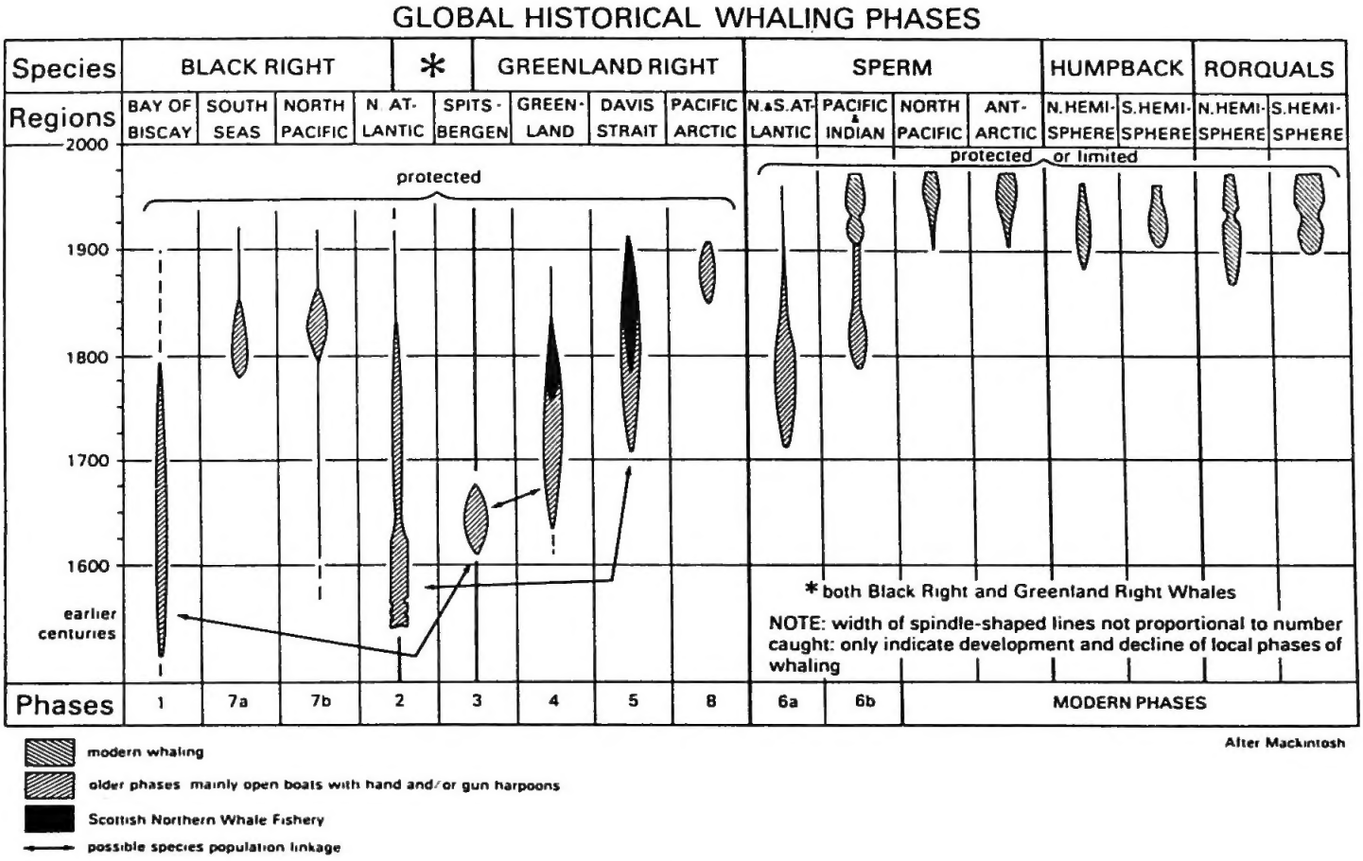


Figure 2

Dutch in the late 1780s. In their turn, early in the nineteenth century, the English were supplanted by the Scots. In 1857, in an attempt to gain advantage in an increasingly competitive trade, the Scottish whaling industry introduced steam-powered vessels. They also opened land stations and eventually turned to bartering with indigenous populations before the First World War brought the Northern whale fishery to a close.[3]

While hunting equipment, techniques, and strategies were determined largely by general anatomical and physiological characteristics,[4] the nature and habits of the species, when combined with different elements of the physical environment, dictated where and when the Greenland Right whale could be harvested. The precise location and duration of this "catching window" were defined by the seasonal migration of the Bowhead between its feeding and breeding grounds.

Although the specific migrational patterns of the Greenland Right whale are not fully understood, certain

3. See for example, C. W. Sanger, "The 19th Century Newfoundland Seal Fishery and the Influence of Scottish Whalemen," *Polar Record* 20, no. 126 (1980): 231-252; and "Dundee Steam-Powered Whalers and the Newfoundland Harp Seal Fishery," *Newfoundland Studies* 4, no. 1 (1988): 1-26.

4. The characteristics of the Greenland Right whale which made it the target species of Northern whalers during the seventeenth, eighteenth and nineteenth centuries are discussed in C. W. Sanger, "'Saw several finners but no whales': The Greenland Right Whale (Bowhead) — An Assessment of the Biological Basis of the Northern Whale Fishery During the Seventeenth, Eighteenth and Nineteenth Centuries," *International Journal of Maritime History* 3, no. 1 (June 1991): 127-154.

aspects were familiar to the Northern whalers. Matthews, for example, points out that "since the earliest days of whaling the whalers have known that their quarry appears at different places at different times of the year — that whales migrate seasonally from one part of the their range to another."[5] The ability to interpret successfully the seasonal movements of the Bowhead was a prerequisite for any master who wished to command an Arctic whaler. Thus, Bowhead whale migration patterns had a definite impact on hunting strategies employed in the Northern whale fishery during the seventeenth, eighteenth and nineteenth centuries.

Greenland Right Whale Migrations

Firsthand accounts of Bowhead migrations are scarce and those extant cover mostly the few months when whales were actually pursued. Inferences on the location of the Greenland Right whale during the winter, for example, are based largely upon incomplete observations and conjecture. For the Greenland Sea, or Spitsbergen, fishery, Scoresby[6] and, towards the end of the nineteenth century, Gray[7] provide particularly valuable descriptions of migration patterns. Scammon's accounts illustrate the seasonal movements of the Bowhead in the Northern Pacific and adjoining Arctic Ocean, areas hunted primarily by American whalers.[8] Most of Scammon's findings have recently been substantiated by Durham.[9]

The migration pattern of the Davis Strait/Baffin Bay Bowhead stock is also poorly understood. Hunting reduced the Eastern Canadian Arctic Greenland Right whale to such low numbers, for example, that research opportunities are infrequent.[10] Eschricht and Reinhardt,[11] however, used Danish West Greenland settlement records to compile a comprehensive data set which, when used with whaling information, provides a fairly reliable indication of the extent of the Bowhead's range during the "non-hunting" seasons of the year.

British log books and journals have been used to construct maps (see Figures 3, 4, 5, 6, and 7 on pages 225-229) which show whale captures and sightings on both of the two major Northern whaling grounds, during periods dominated first by sail then by steam vessels. These maps clearly delineate a substantial portion of the seasonal migrations of the Greenland Right whale. They also identify the temporal and spatial parameters of the offshore component of the Northern whaling industry during the seventeenth, eighteenth, and nineteenth centuries.

5. L. H. Matthews, *The Natural History of the Whale* (London, 1978), p. 117.

6. See, for example, W. Scoresby, Jr., *Memorials of the Sea* (London, 1835); *Journal of a Voyage to the Northern Whale-Fishery; Including Researches and Discoveries on the Eastern Coast of West Greenland, Made in the Summer of 1822, in the Ship* Baffin *of Liverpool* (Edinburgh, 1823); and *An Account of the Arctic Regions with a History and Description of the Northern Whale-Fishery*, vols. 1 and 2 (Edinburgh, 1820).

7. Other than the experience gained from participating in eight whaling voyages, Gray also had access to the whaling logs of both his father and uncle, two of Peterhead's most successful Northern masters. See, for example, R. W. Gray, "Peterhead Sealers and Whalers: A Contribution to the History of the Whaling Industry," *The Scottish Naturalist* (September - October, 1932): 129-133; (November-December, 1932): 157-162; (January-February, 1933): 1-10; (March-April, 1933): 33-38; (July-August, 1933): 97-104; (September-October, 1933): 129-138; and (November-December, 1933): 161-170.

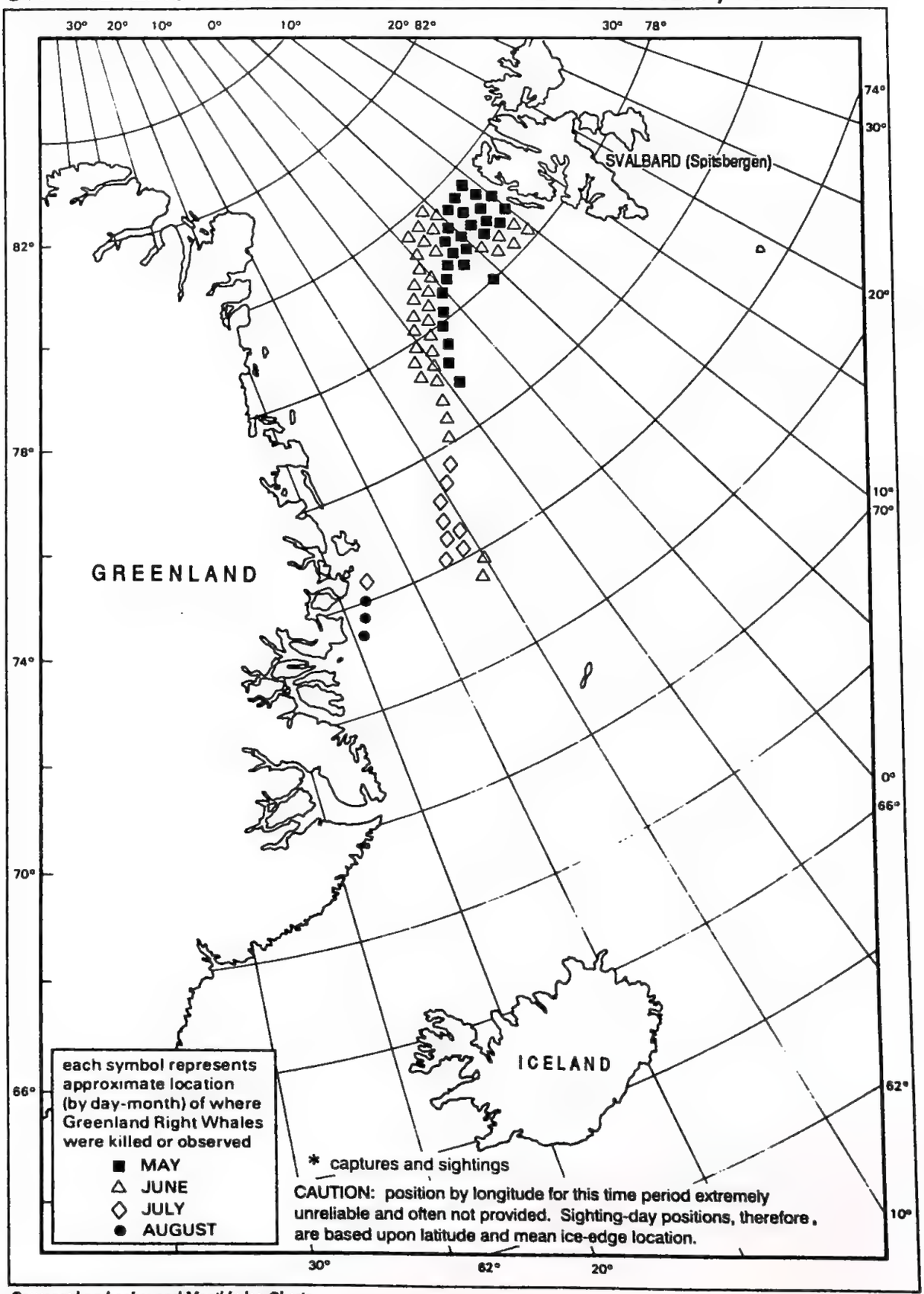
8. C. M. Scammon, *The Marine Mammals of the North-Western Coast of North America: Together with an Account of the American Whale-Fishery* (San Francisco, 1874).

9. See, for example, F. E. Durham, *The Catch of Bowhead Whales (Balaena mysticetus) by Eskimos, with Emphasis on the Western Arctic* (Los Angeles, 1979). Recent study of the Bowhead has concentrated on the Western Arctic Greenland Right whale. For additional evidence of the Bering Sea stock, based largely on information provided by the aboriginal fishery, see, for example, R. Gambell, "Bowhead Whales and Alaskan Eskimos: A Problem of Survival," *Polar Record* 21 (1983): 467-473; K. W. Hazard and L. F. Lowry, "Benthic Prey in a Bowhead Whale from the Northern Bering Sea," *Arctic* 37, no. 2 (1984): 166-168; and M.K. Nerini, H. W. Braham, W. M. Marquette, and D. J. Rugh, "Life History of the Bowhead Whale, *Balaena mysticetus* (Mammalia: cetacea)," *Journal of Zoology* 204 (1984): 443-468.

10. Nevertheless, useful work by Reeves and Mitchell in particular has drawn on historical evidence to provide information on the nature, distribution and migration of Bowheads which supported commercial whale fisheries in Hudson Bay, Davis Strait and Baffin Bay. See, for example, R. R. Reeves, E. Mitchell, A. Mansfield, and M. McLaughlin, "Distribution and Migration of the Bowhead Whale, *Balaena mysticetus*, in the Eastern North American Arctic," *Arctic* 26, no. 1 (1983): 5-64, and E. Mitchell and R. R. Reeves, "Catch History and Cumulative Catch Estimates of Initial Population Size of Cetaceans in the Eastern Canadian Arctic," *Report of the International Whaling Commission* 31 (1981): 645-682. For an indication of the highly selective nature of other contemporary information available on this stock, see A. Jonsgard, "Bowhead Whales, *Balaena mysticetus*, Observed in Arctic Waters of the Eastern North Atlantic after the Second World War," *Report of the International Whaling Commission* 31 (1981): 551.

11. D. F. Eschricht and J. Reinhardt, "On the Greenland Right-Whale *(Balaena mysticetus)*," in D. F. Eschricht, et al., eds., *Recent Memoirs on the Cetacea* (London, 1866), pp. 1-150.

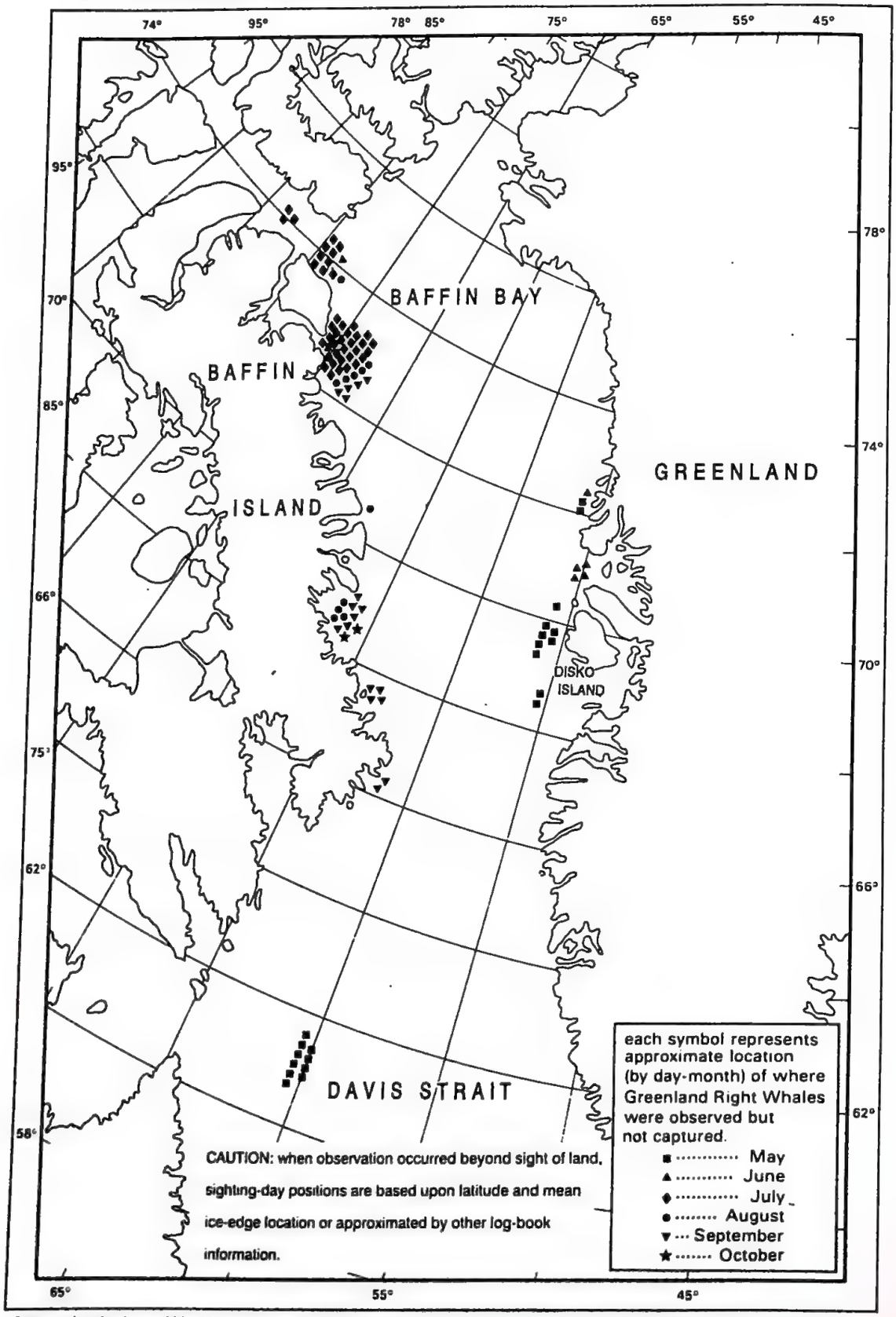
WHALING RESULTS* OF 9 BRITISH SAILING VESSEL VOYAGES ON THE EAST GREENLAND HUNTING GROUNDS, 1822-1866



Sources: Log books; and Monthly Ice Charts, Meteorological Office, Bracknell, Berkshire.

Figure 3

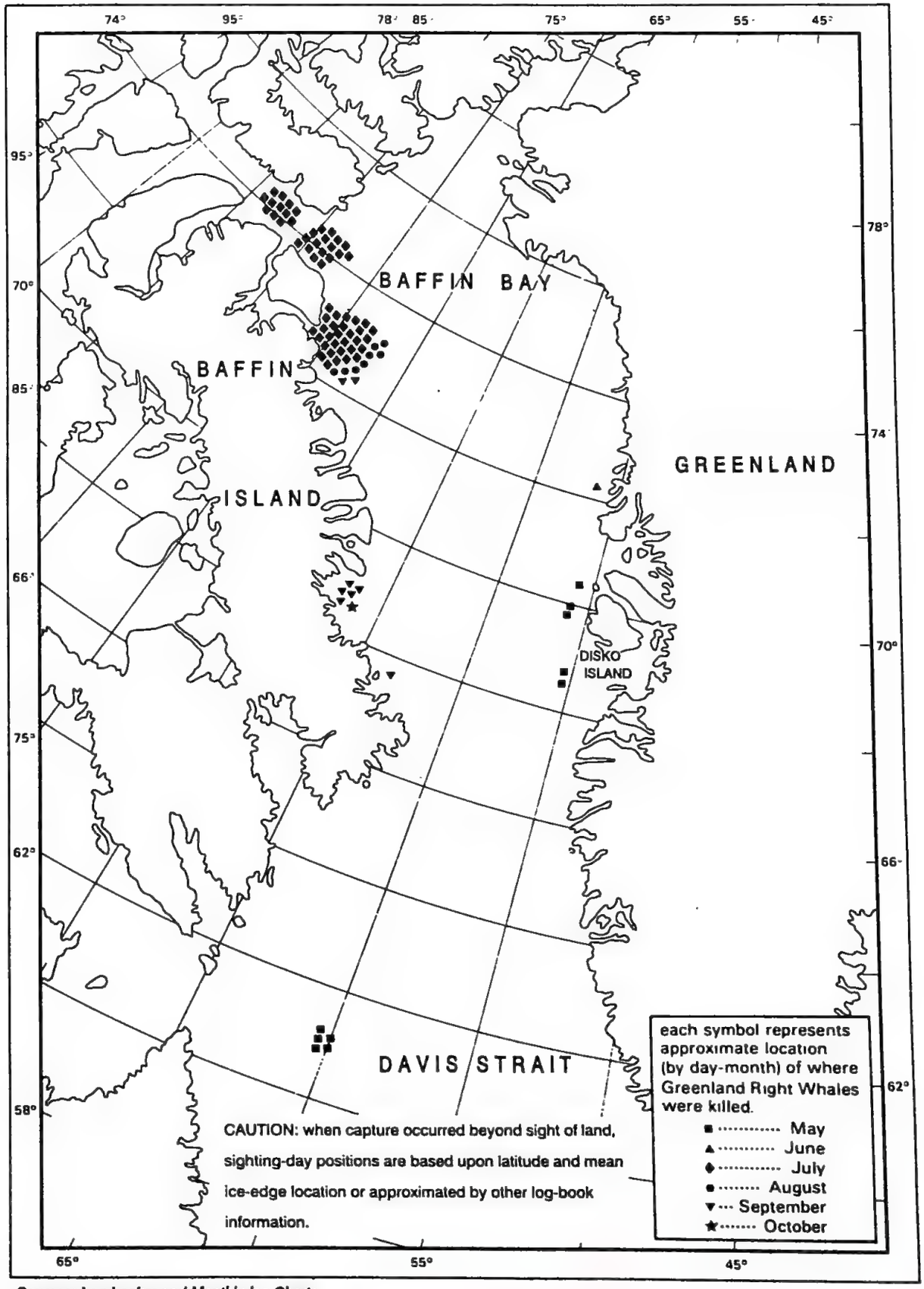
WHALE SIGHTINGS: 10 SCOTTISH SAILING VESSEL VOYAGES ON THE DAVIS STRAIT - BAFFIN BAY HUNTING GROUNDS (1830-1853)



Sources: Log books; and Monthly Ice Charts, Meteorological Office, Bracknell, Berkshire.

Figure 4

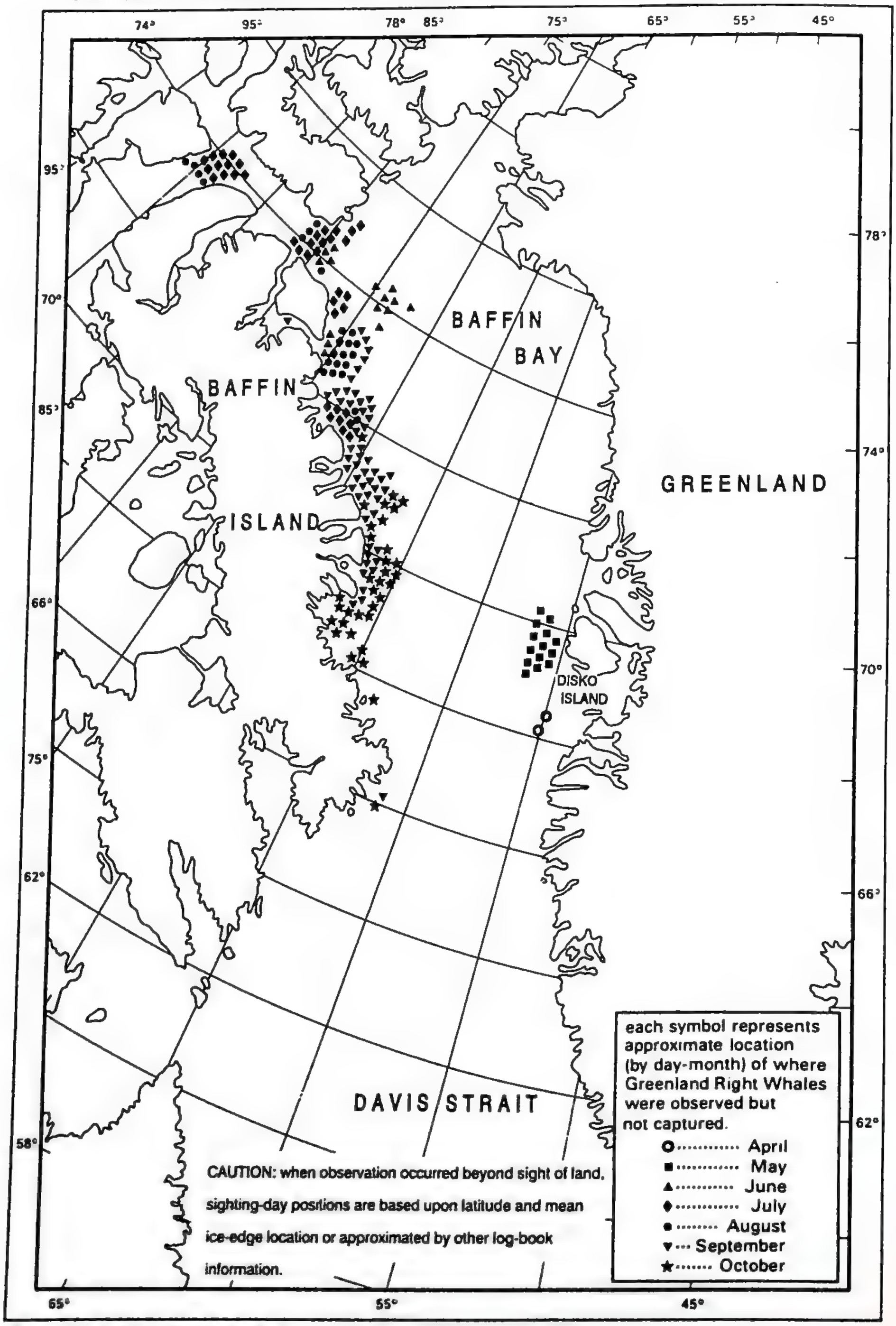
WHALE CAPTURES: 10 SCOTTISH SAILING VESSEL VOYAGES ON THE DAVIS STRAIT - BAFFIN BAY HUNTING GROUNDS (1830-1853)



Sources: Log books; and Monthly Ice Charts, Meteorological Office, Bracknell, Berkshire.

Figure 5

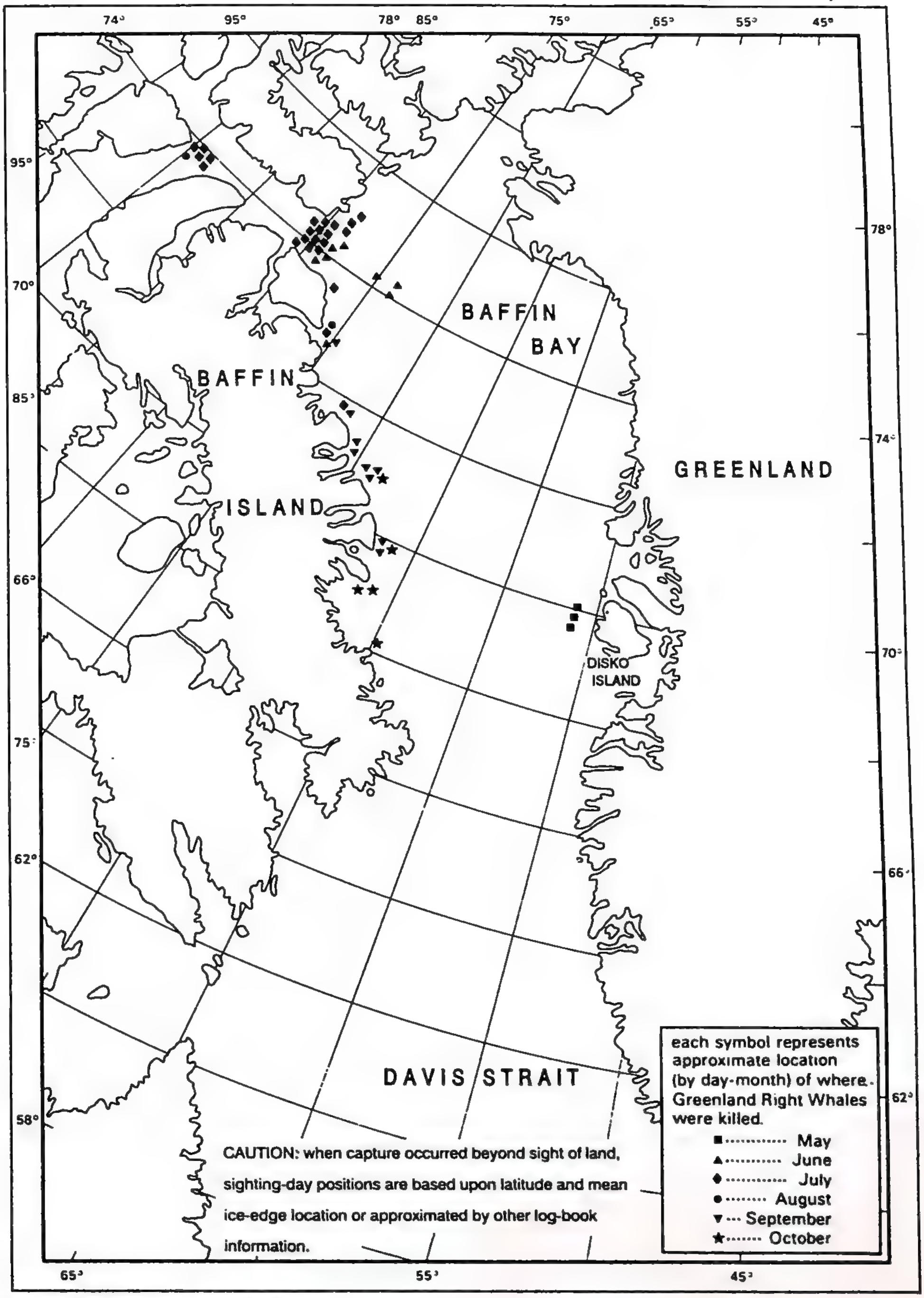
WHALE SIGHTINGS: 16 SCOTTISH STEAMER VOYAGES ON THE DAVIS STRAIT-BAFFIN BAY HUNTING GROUNDS (1885-1900)



Sources: Log books; and Monthly Ice Charts, Meteorological Office, Bracknell, Berkshire.

Figure 6

WHALE CAPTURES: 16 SCOTTISH STEAMER VOYAGES ON THE DAVIS STRAIT-BAFFIN BAY HUNTING GROUNDS (1885-1900)



Sources: Log books; and Monthly Ice Charts, Meteorological Office, Bracknell, Berkshire.

Figure 7

GREENLAND SEA-SPITSBERGEN (EAST GREENLAND) STOCK

The migratory habits of the Greenland Sea Bowhead are not as well understood as those of the Davis Strait Greenland Right whale. Virtually all that is known has been passed on by British and Dutch whaling masters. As the East Greenland fishery was prosecuted primarily by sailing vessels,[12] captains often found it difficult to cope with adverse ice conditions and other environmental hazards. Greenland Right whales, therefore, could only be intercepted during their late spring and early summer migration. As Scoresby commented:

> It is not yet ascertained, what is the earliest period of the year, in which it is possible to fish for whales. The danger attending the navigation, amidst massive drift ice in the obscurity of night, is the most formidable objection against attempting the fishery before the middle of the month of April, when the sun having entered the northern tropic, begins to enlighten the Polar regions throughout the twenty-four hours. Severity of frost, prevalence of storms, and frequency of thick weather, arising from snow and frost rime, are the usual concomitants of the spring of the year; and these, when combined with the darkness incident to night, a tempestuous sea, and crowded ice, most probably produce as high a degree of horror in the mind of the navigator, who is unhappily subjected to their distressful influence, as any combination of circumstances which the imagination can present.[13]

Many of the Northern whaling masters would first seek out the Harp seal rookeries off Jan Mayen (see Figure 8 below). Then, following the dispersal of the whelping patch towards the end of April, they would proceed northeastward along the edge of the pack ice in order to gain access to the Greenland Right whale feeding grounds. The April 7, 1791 journal entry of George Kerr, surgeon on the Aberdeen whaler *Christian*, for example,

12. Spitsbergen Greenland Right whale stocks had been reduced to such low levels by the time steamers had been introduced into the trade that most of the Greenland Sea whaling log books belong to sailing vessels. See, for example, C. W. Sanger, "Environmental Factors Affecting 17th-19th Century Whaling in the Greenland Sea," *Polar Record* 27, no. 161 (1991): 77-86.

13. Scoresby, *Account of the Arctic Regions*, vol. 2, p. 207.

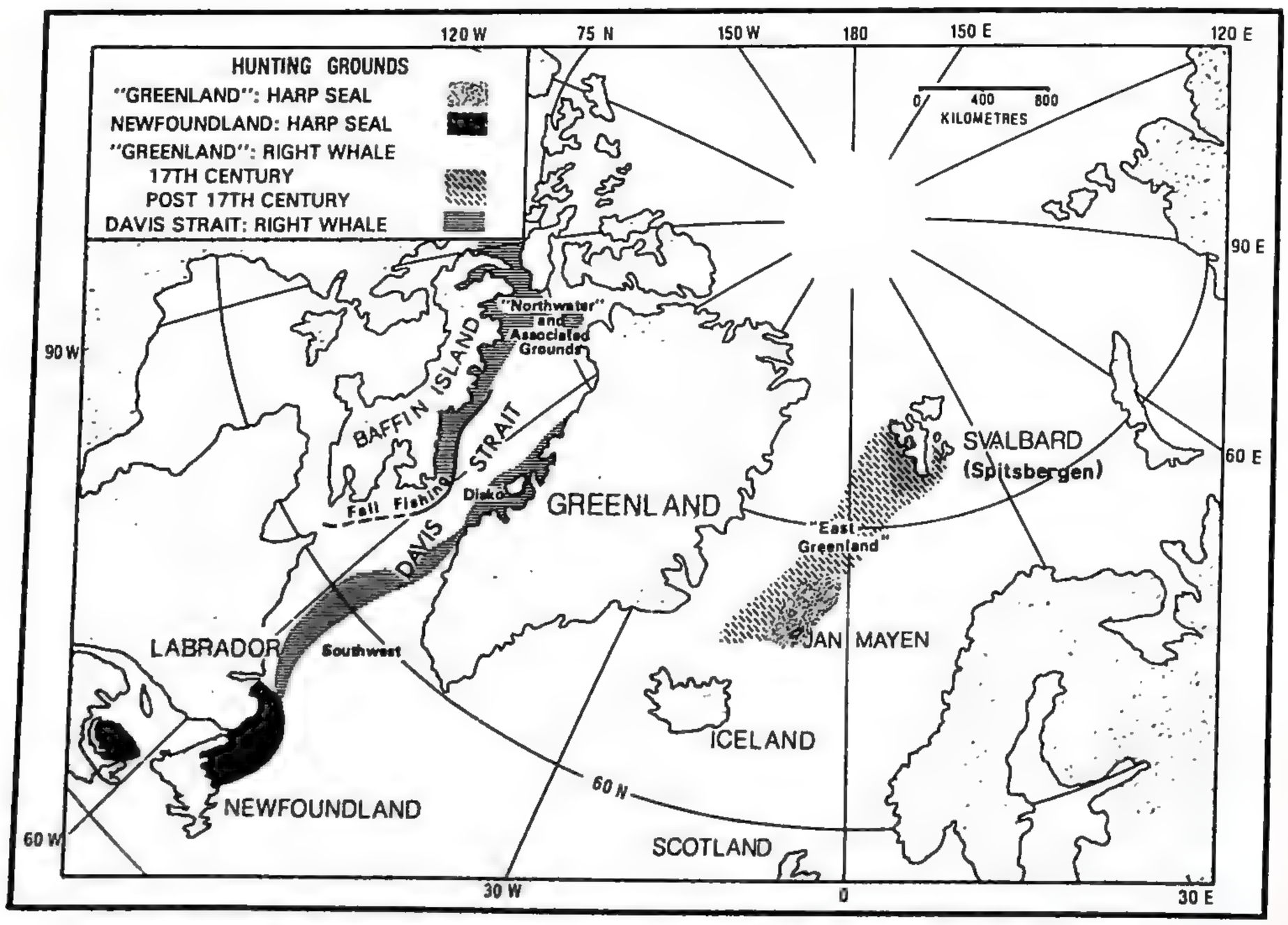


Figure 8: Newfoundland and Scottish Harp Seal and Right Whale Hunting Grounds.

reads: "We now intend to steer to the NE as our hopes of the seal fishery are almost gone."[14] That whales were not pursued at an earlier date was not so much due to the fact that the seal fishery was a more attractive alternative, but rather reflected the constraints imposed by wind, sea, and ice. Greenland Right whales were simply not accessible to the hunters during late winter and early spring. While ice conditions usually restricted entry into the higher latitudes prior to May, in most years whales were able to proceed northward at a much earlier date. In 1634, for example, seven Dutch sailors who had wintered at Smeerenberg, Spitsbergen, recorded in their journal that on April 27, "in the evening, the first whales (thank God!) made their appearance in the bay."[15] By early May, however, most masters were attempting to gain entrance to the Northern whaling grounds, commonly referred to as the "whale-fishing bight" to the west of Spitsbergen (see Figure 3 on page 225). In 1852, for instance, a paying passenger on the Peterhead whaler *Eclipse* noted that on May 8 the vessel was "boring for whale fishing ground,"[16] and on that same date in 1864, a crewman on another Peterhead whaler noted in his diary that they were on their "passage to the whaling ground."[17] The formation of extremely rich feeding grounds, and ice conditions which often imposed a temporary halt to the Greenland Right whale migration, when combined with improving environmental conditions that permitted easier and safer navigation, normally enabled the Northern whalers to intercept their prey during the late spring and early summer months. These East Greenland hunting grounds, described by both Scoresby[18] and Gray,[19] are clearly depicted in Figure 3.

Defined spatially by the eastern edge of the pack ice to the west and north (see Figure 9, a-g, on page 232), and the western shores of Spitsbergen to the east, the hunt was usually in full swing by the middle of May.[20] The figures also show, however, that the operation, commonly referred to as the "north-fishing,"[21] was usually of short duration. The whales would normally have resumed their northward migration by the middle of June, thus moving beyond the reach of the hunters. On June 13, 1791, for example, Kerr's journal carried the following note: "No one entertains any hopes of a fishing now."[22]

The whale fishery, as Gray explained, was usually brought to an abrupt halt[23] by changes in the pack ice which permitted the whales to continue their northward trek onto higher latitude feeding grounds:

> According to my father [Captain D. Gray], the whales made their appearance in the outskirts of the ice north of lat. 78° about 15th May, but only remained in that locality until the opening of the ice permitted them to resume their northward journey; at any rate, usually about the middle of June they disappeared into its depth and were last seen going north-west. The "north-fishing" was then over for a season.[24]

Towards the end of the second decade of the nineteenth century, however, drastically reduced stocks, lower average catches, and new developments in the Davis Strait fishery[25] encouraged British whalers to extend the length of their Greenland voyages in an attempt to open fresh whaling grounds. The midsummer "southern fishery"[26] which subsequently evolved is also depicted in

14. Journal of G. Kerr, medical officer, aboard *Christian*, April 7, 1791. University Library, King's College, Aberdeen.

15. J. Segersz, "Journal of Day-Book Kept by Seven Sailors During their Wintering on Spitsbergen in Mauritius Bay," in W. M. Conway, ed., *Early Dutch and English Voyages to Spitsbergen in the Seventeenth Century* (London, 1904), p. 157. For information on an earlier (1630-31) overwintering experiment by the Dutch, see E. Pellham, "God's Power and Providence in the Preservation of Eight Men in Greenland Nine Months and Twelve Dayes," in A. White, ed., *A Collection of Documents on Spitzbergen and Greenland* (London, 1855), pp. 252-283.

16. J. B. Arbuthnot, "Journal of a Voyage to the Greenland Seal and Whale Fishing," aboard *Eclipse*, May 8, 1852. Peterhead Public Library. Arbuthnot was a paying passenger on *Eclipse*.

17. Account written from rough notes by J. Wilson, a crewman aboard *Sir Colin Campbell*, May 8, 1864. Peterhead Public Library.

18. Scoresby, *Account of the Arctic Regions*, vol. 2, pp. 207-21.

19. R. W. Gray, "Peterhead and the Greenland Sea," *Buchan Club Transactions* 15-16 (1935-42): 103-106.

20. The offshore component of eighteenth and nineteenth century Northern whaling was described by Elking in his 1722 proposal to revitalize the British Northern whale fishery: "The whale-fishing is carry'd on in the great Frozen Sea between the coasts of Greenland and Spitsbergen, in the latitude of 70 to 80 degrees north; and as they have here no night, but see the sun always, during the season of the fishery, above the horizon, they divide the time not by day and night, but into three watches, allowing one third of the crew to be at rest for eight hours, when they turn out for the next; and so alternately they are upon duty sixteen hours, and asleep eight hours in every twenty-four." H. Elking, "A View of the Greenland Trade and Whale Fishery, with the National and Private Advantages Thereof," in J. R. McCulloch, ed., *A Select Collection of Scarce and Valuable Tracts on Commerce* (London, 1859), pp. 74-75.

21. Ibid., p. 105.

22. *Christian* journal, June 13, 1791.

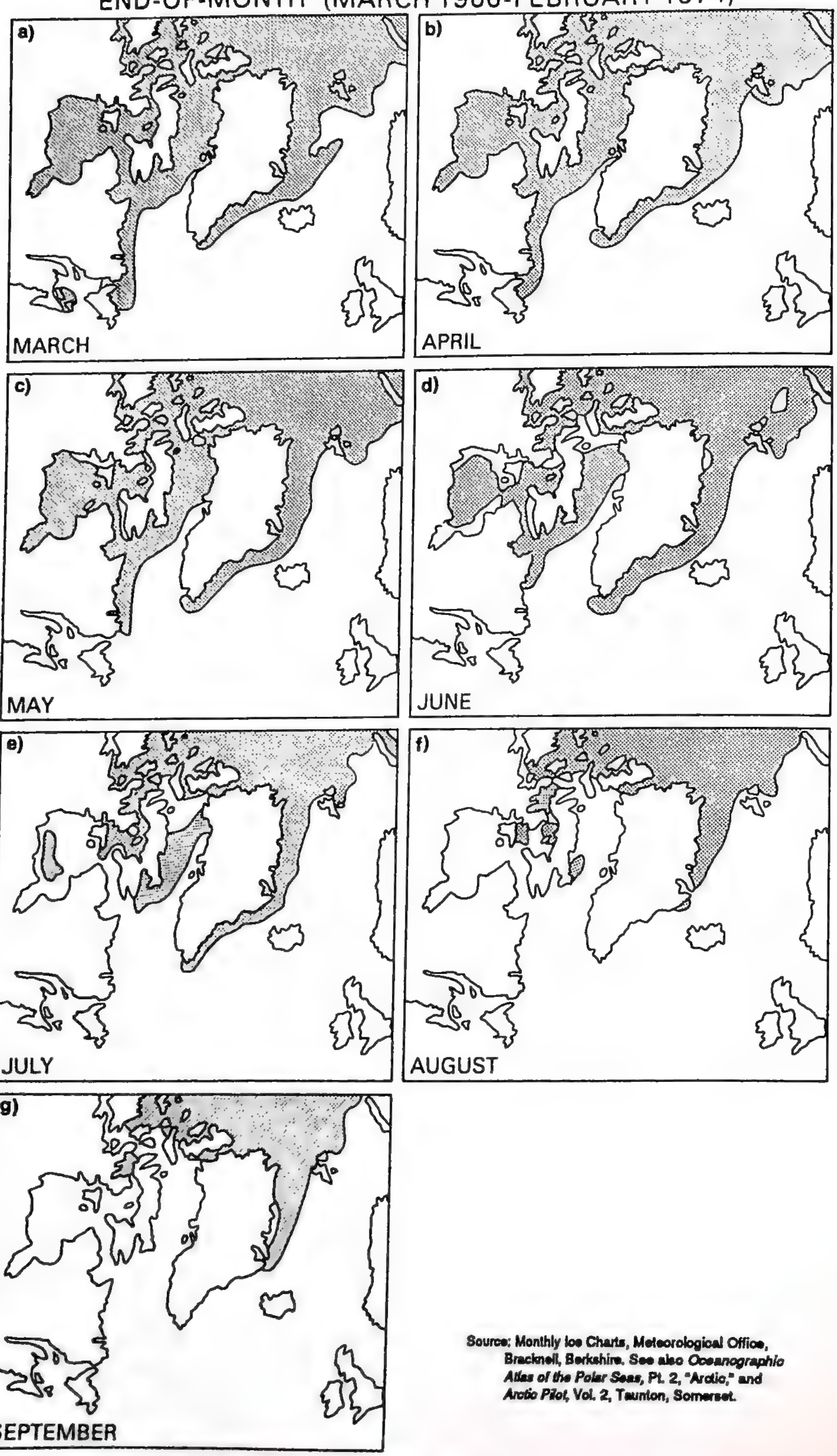
23. Scoresby, for example, observed that the whales "all disappear within the space of a very few days." *Account of the Arctic Regions*, vol. 2, p. 214.

24. Gray, "Peterhead and the Greenland Sea," pp. 104-105.

25. The opening of the Baffin Bay stations north of Disko Island. See, for example, Sanger, "The Origins of the Scottish Northern Whale Fishery," pp. 321-345.

26. Scoresby, *Journal of a Voyage to the Northern Whale Fishery*, p. 66.

SEA ICE NORMALS: MEAN LIMITS, 4/10 CONCENTRATION,
END-OF-MONTH (MARCH 1966-FEBRUARY 1974)



Source: Monthly Ice Charts, Meteorological Office, Bracknell, Berkshire. See also *Oceanographic Atlas of the Polar Seas*, Pt. 2, "Arctic," and *Arctic Pilot*, Vol. 2, Taunton, Somerset.

Figure 9 (a-g)

Figure 3. Although depleted stocks were no longer able to support a large-scale, commercial operation, the pattern illustrated in Figure 3 corroborates Gray's description of this brief attempt to revitalize the East Greenland fishery:

> If unsuccessful in obtaining a cargo at the northern ground, the ships proceeded south-westwards as far as 75°, where if the ice were sufficiently open, they penetrated westward until the Greenland coasts, or "West Land," as it was called, was visible from aloft. There they cruised about or lay made fast to a floe, keeping a look-out for whales until the middle of August, when the darkness of the nights put an end to the south fishing for a season.[27]

Davis Strait-Baffin Bay Stock

The maps in Figures 4, 5, 6, and 7 define the temporal and spatial limits of the Davis Strait whale fishery. They also show the evolution of the West Greenland component of the trade. While the very first European whalers hunted in the general vicinity of Disko Island, the Scots developed an earlier spring operation towards the end of the eighteenth century.[28] This second phase was known as the Southwest fishery and, as shown in Figures 4, 5, and 10 on pages 226, 227, and 234, was conducted along the ice-edge off the entrance to Hudson Bay. Scottish whaling master James Fairweather, for example, having retired after fifty-two years in the trade, noted that "from Resolution Island in lat. 61° N to Disco [sic], in the early part of the year, is all considered good whaling ground when in amongst the ice a bit."[29] Success in the Southwest fishery required the interception of the Greenland Right whale at the southern extremity of its range, prior to the beginning of the spring migration. The active pursuit began when environmental conditions improved sufficiently towards the end of winter to permit the use of open whaling boats and just before increasing spring sunlight triggered off the retreating ice-edge phytoplankton bloom. Timing, therefore, was critical. On April 7, 1895, for example, a Captain Adams of Dundee recorded the following log entry: "I hope to get a fair wind soon as I would like to be at the SW fishing ground this week."[30] Almost a month later, on May 4, another entry read: "I wish we would get a whale and we have only a fortnight here now."[31]

Adams then sailed northeastward along the ice-edge (see Figure 9, a-g) to the traditional whaling grounds off Disko. The Disko Island component of the West Greenland fishery, shown in Figures 4, 5, 6, and 7, was also an early operation. By the middle of May, all masters attempted to have their vessels positioned so as to be able to maneuver freely between the pack ice to the west and the coast of Greenland to the east. On May 20, 1831, for example, the *Hercules* was "reaching NE and cross the Straits towards the East Land."[32] Ice conditions similar to those that caused the Spitsbergen fishery to be concentrated in the "whale fishing bight" also appear to have sustained the Disko fishery. While the pack ice remained too heavily concentrated to permit the Greenland Right whale easy access to its northern summer feeding grounds, the European whalers were able to hunt under what were relatively favorable conditions — usually far better than those experienced on the Southwest grounds. As at East Greenland, however, the Bowheads were normally able to resume their northward migration by the end of May, thus bringing the Disko Island fishery to a close.

Circumstances in 1817 and 1818 encouraged the expansion of the traditional fishery, once again under the influence of Scottish masters, northwards into Baffin Bay.[33] This route, of necessity, followed the west coast of Greenland across Melville Bay. There is evidence that the Greenland Right whale also followed the same route, but, with its greater "marine capability," was able to make the northward passage at an earlier date. In 1817, for instance, two Scottish masters, the first European whalers to venture northward beyond the traditional hunting grounds, obtained excellent catches throughout June and July in the vicinity of Melville Bay. Similarly, Ross and Parry (leaders of a British naval expedition), while working northward during the following year, accompanied for a time by several members of the whaling fleet, observed large numbers of whales being taken in July while the flotilla was still to the south of Melville Bay.[34] As the passage northward became a regular occurrence, however, sightings of whales

27. Gray, "Peterhead and the Greenland Sea," p. 105.

28. Sanger, "The Origins of the Scottish Northern Whale Fishery," pp. 568-610.

29. J. Fairweather, *With the Scottish Whalers: The Story of a Shipmaster's Fifty-Two Years at Sea* (Dundee: Printed for private circulation, 1928), pp. 24-25.

30. Log of the *Esquimaux*, April 7, 1895. Broughty Castle Museum.

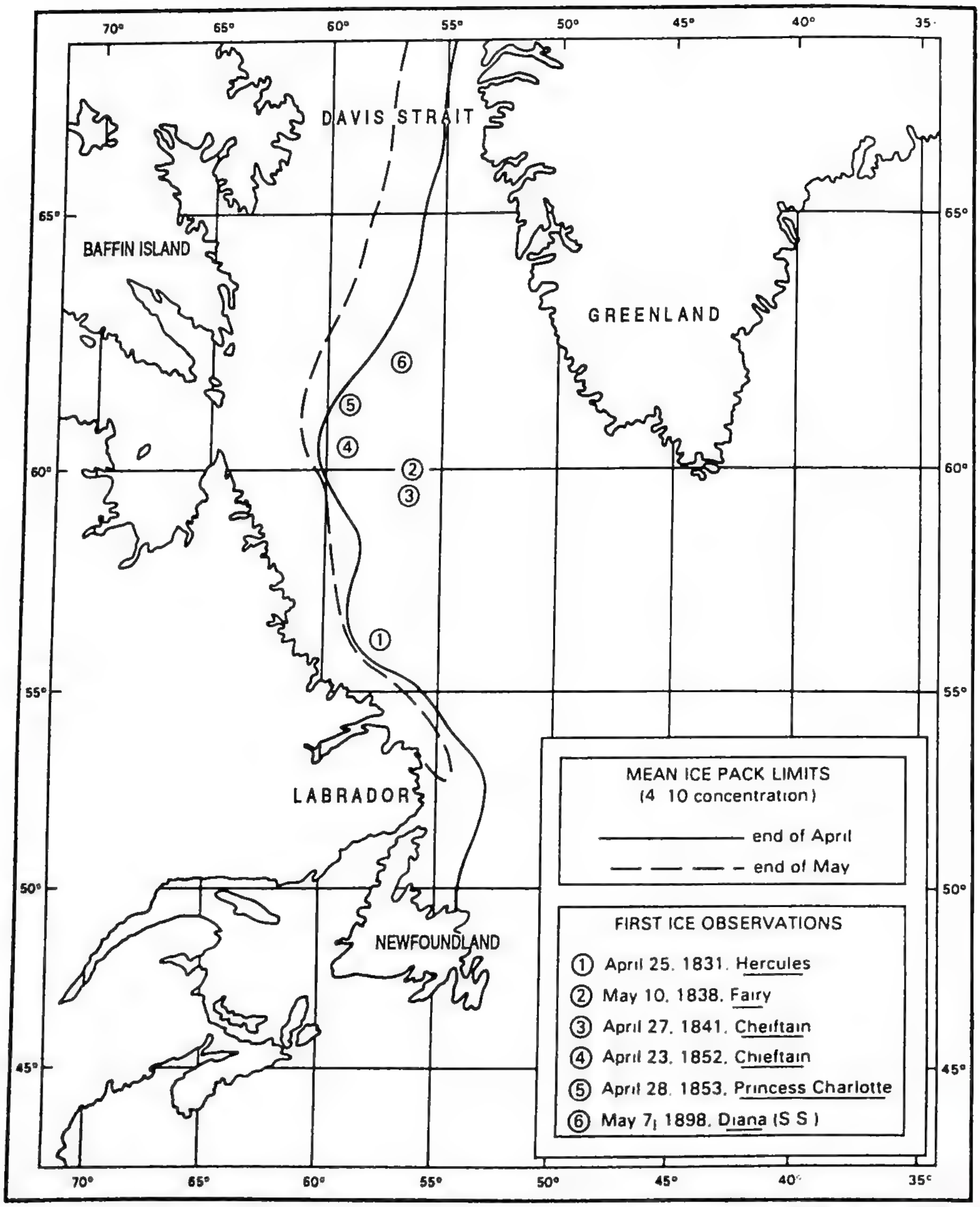
31. Ibid., May 4, 1895.

32. Journal kept by medical officer aboard *Hercules*, May 20, 1831. University Library, King's College, Aberdeen.

33. See for example, Sanger, "The Origins of the Scottish Northern Whale Fishery," pp. 321-345.

34. R. Phillips, *Journal of a Voyage of Discovery, to the Arctic Regions, Performed between the 4th of April and the 18 of December, 1818, in His Majesty's ship Alexander, W. M. Edw. Parry, Esq. Lieut. and Commander* (London, 1819), pp. 44-50.

SOUTHWEST WHALING GROUNDS



Sources: Log Books; and Monthly Ice Charts, Meteorological Office, Bracknell, Berkshire.

Figure 10

along the west coast of Greenland became less frequent (see Figures 4, 5, 6, and 7). While this may have been primarily a sign of significant stock reduction, it also appears to have been at least partially due to migration modification in response to increased whaling activity.[35]

By the beginning of June, the majority of the whaling masters had moved off the Disko grounds and commenced the difficult and dangerous northward passage across Melville Bay. Their goal was to reach the "North Water" and then proceed westward across Baffin Bay to the "West Land" (see Figure 8 on page 230). Ideally, each vessel would be positioned along the land-fast ice off Pond Inlet and/or Lancaster Sound by the middle of June, but certainly before the clearing of Lancaster and Eclipse Sounds permitted the Greenland Right whales to move onto their northernmost summer feeding grounds. With ice barriers interrupting the seasonal migration, the entrances to these sounds became the foci of the Baffin Bay fishery, and timing, again, was critical. Adams, for example, indicated while off Pond Inlet on June 7, 1895, that he was "on good fishing ground but too early for whales I think."[36] Similarly, Captain McKay, master of the *Esquimaux* in 1899, noted while waiting at the land-fast ice stretching across the entire width of Lancaster Sound, that he was "in a splendid position for whales."[37] These two regions, then, as Figures 4, 5, 6, and 7 show, became the most important centers of the Baffin Bay whale fishery.

While there was considerable variation from year to year, the breakup of the fast ice in Eclipse and Lancaster Sounds usually occurred before the early part of July. Although the whaling steamers, with their greater maneuverability, were sometimes able to pursue the migrating whales as far as Prince Regent Inlet (see Figures 6 and 7 on pages 228 and 229), the last part of July and much of August normally represented a period of enforced idleness.

By the end of August or the first part of September, the whales reappeared — passing through Lancaster Sound and Pond Inlet before moving south along the east coast of Baffin Island. With drastically reduced stocks, smaller average catches, and increasingly uncertain profits, owners and masters during the latter half of the nineteenth century were forced to develop yet another whaling operation. The "Fall Fishery," while increasing the length of individual voyages and opening up new hunting grounds along the east coast of Baffin Island (see Figures 4, 5, 6, and 7), was intended to improve or, especially towards the end of the Northern whale fishery, salvage profits by taking advantage of the regular return of the Greenland Right whale onto its winter range. As Captain Middleton explained, following his retirement from the trade: "Whales having gone north in the spring, are sure to come south again in the autumn. As a last resourse [sic], if the spring and summer fishery have been unsuccessful, an attempt is made to catch a stray one on his passage to winter quarters."[38]

Depending upon environmental conditions, this segment of the hunt could continue well into October. The spatial imprecision of the autumn operation was primarily due to the fact that the southward migration of the Greenland Right whale usually occurred at a fairly rapid pace. Captain Milne, for instance, made the following observation on October 7, 1897, while operating off Home Bay: "A good many whales seen today but not resting."[39] Similarly, Captain Phillips, at Egglington Harbour on September 17, 1891, noted that the whales were "taking to Southward very fast."[40] The speed of the southward fall migration and deteriorating environmental conditions account for the considerable variation between the number of Greenland Right whales sighted and the actual number taken during this component of the Davis Strait fishery (see Figures 4, 5, 6, and 7).

The maps, then, clearly indicate the temporal and spatial regularities of the seasonal migrations of the Greenland Right whale[41] — patterns which determined the annual formats of the Davis Strait/Baffin Bay commercial whale fisheries. As Eschricht and Reinhardt explained: "The Greenland whale is thus, like other Cetaceans, a migratory animal . . . it changes its station, according to the season, with perfect regularity; and in some cases even

35. See for example, Eschricht and Reinhardt, "On the Greenland Right Whale," p. 14.

36. *Esquimaux* log, June 7, 1895.

37. A. B. Walker, journal kept aboard *Esquimaux*, July 16, 1899, Broughty Castle Museum. Walker was the principal financial backer of the trip, and his journal was used as the basis for the book, *Cruise of the Esquimaux*, published in 1906.

38. L. Middleton, *Whaling Recollections: 1818-1888* (n.p.: Private printing, 1888[?]), p. 33.

39. Log of the *Eclipse (2)*, October 7, 1897. Broughty Castle Museum.

40. *Esquimaux* log, September 17, 1891, kept by W. Stenhouse, first mate. Broughty Castle Museum.

41. Note, however, that these maps do not account for the presence of Bowheads in Hudson Bay (see, for example, W. G. Ross, *Whaling and Eskimos: Hudson Bay 1860-1915* [Ottawa, 1975]). While there is some evidence that there may be a secondary migration southward onto the winter range via Fury and Hecla Strait, there is also evidence that a certain proportion of the Davis Strait Bowhead stock may, in fact, winter in Hudson Bay. See, for example, Fairweather, *With the Scottish Whalers*, p. 24; and "Seal and Whale Fishing," in *Dundee Year Book: Facts and Figures for 1881* (Dundee, 1882), p. 83.

the same individuals have been observed to return annually to the same bays and fiords."[42]

General Migration Characteristics of the Greenland Right Whale

While the seasonal migrations of the Greenland Right whale are initiated by the need to satisfy feeding requirements and breeding instincts, the temporal and spatial dimensions of these movements are largely dictated by the annual retreat and subsequent advance of pack ice (see Figure 9, a-g on page 232). The Greenland Right whale, as Eschricht and Reinhardt noted, is inclined "to stay near and among the ice."[43]

Bowheads, then, are located "always amongst or close to arctic pack-ice,"[44] and all aspects of the Northern whale fishery, therefore, with the exception of the very latest phase (the Fall Fishery at Davis Strait), were conducted in essentially the same fashion as that described by Elking early in the eighteenth century: "The whales are found among the ice, in the openings and vacancies between it; and thither the ships sail in quest of them, running boldly in between great floating islands of ice, which lye continually on either hand of them, commonly called fields of ice, and are often of many leagues circumference."[45]

The Greenland Right whale also appears to be a fairly gregarious animal. British whaling logs and journals, for example, confirm Brown's observation, following his 1861 visit to Davis Strait, that the species is "generally found in small 'schools' of three and four, but when travelling from one part of the ocean to another they will sometimes collect in small parties."[46] The migration from one range to another along the ice-edge was not, as Mackintosh pointed out, "mass movements of the whole or even the majority of the population, but more in the form of a long drawn out procession."[47] Recent observations by Durham in the Western Arctic confirm this characteristic of Bowhead migrations:

> The inherent urge of the whale is timed with the breaking up of the ice pack. The whales use leads. . . as passageways through sea ice from the Bering Strait to their summer feeding grounds . . . I conclude that the spring migration normally consists of a series of runs with peaks 7 to 15 days apart. A run is when many whales pass during a period of a few days.[48]

As noted earlier, the Greenland Right whale maintained speeds when travelling which made it vulnerable to attack by the Northern whalers. The Bowhead migration through Bering Strait, for example, while showing steady movement, indicated that with ideal ice and weather conditions the ten-day travel time between Port Hope and Barrow was achieved at speeds which averaged "56 kilometers (35 miles) per day or 2.4 kilometers (1.5 miles) per hour."[49] Only tightly compressed ice conditions and/or the presence of planktonic swarms tended to interrupt the movement between summer and winter ranges. On such occasions, however, the Greenland Right whale was particularly susceptible to wholesale slaughter (see Figures 3 and 5 on pages 225 and 227). As Fairweather noted, for example, when commenting on the Lancaster Sound hunting station: "It will be seen that when a whaler gets to Lancaster Sound, she is, so to speak, at the gate where the whales have to pass through. Large quantities were caught there, which killed the goose that laid the golden egg, so to speak, and brought the trade to a standstill."[50]

One final migration characteristic of the Greenland Right whale also had minor implications for the Northern whaling trade. It appears that Bowhead pods "are random gatherings."[51] Durham's research indicates that "the suggestion of age and sex groups in the first three runs is not sharp . . . [and] . . . whales of all ages and both sexes pass in the fourth run."[52] The heterogeneous groups also explain the lack of any set pattern to the size of whales taken by Scottish whalers, both sail and steam, at Davis Strait and Spitsbergen during the nineteenth century (see Tables 1, 2, and 3 on pages 237 and 238). Similarly,

42. Eschricht and Reinhardt, "On the Greenland Right-Whale," p. 9.

43. Ibid., p. 24.

44. W. F. J. Morzer-Bruyns, *Field Guide of Whales and Dolphins* (Amsterdam, 1971), p. 161. See also K. R. Allen, *Conservation and Management of Whales* (Seattle, 1980), p. 7; L. H. Matthews, *The Natural History of the Whale* (London, 1978), p. 126; W.M. Marquette, "Bowhead Whale," in D. Haley, ed., *Marine Mammals of Eastern North Pacific and Arctic Waters* (Seattle, 1978), p. 74; and J.R. Norman and F. C. Fraser, *Giant Fishes, Whales and Dolphins* (London, 1937), p. 207.

45. Elking, "A View of the Greenland Trade and Whale Fishery," p. 75.

46. R. Brown, "Notes on the History and Geographical Relations of the Cetacea Frequenting Davis Strait and Baffin Bay," *Proceedings of the Zoological Society of London*, pt. 3 (June-December, 1868): 540.

47. N. A. Mackintosh, *The Stocks of Whales* (London, 1965), p. 64.

48. Durham, *The Catch of Bowhead Whales by Eskimos*, p. 8.

49. Ibid., p. 10.

50. Fairweather, *With the Scottish Whalers*, p. 24.

51. R. Burton, *The Life and Death of Whales*, (London, 1973), p. 63.

52. Durham, *The Catch of Bowhead Whales by Eskimos*, p. 9.

1873 statistics indicate that both sexes were equally available over the duration of the entire hunting season (see Table 4 on page 239). Whaling ground preferences, therefore, appear to have been dictated by factors other than age/size structures and sex composition.

Thus, the character of the Northern whale fishery, the success or failure of the efforts of masters, seamen, and companies, and the overall development and subsequent decline of the industry, were all influenced in various ways by the nature of the resource. The nature and habits of the Greenland Right whale made it the only species of whale frequenting northern waters which could be successfully harvested by commercial whalers prior to the introduction of steam-powered chasers and explosive harpoons in the latter half of the nineteenth century.

The physical attributes of the Bowhead determined largely which strategies, equipment, and techniques could be used in the hunt. Its ability to adapt to harsh high latitude environmental conditions ensured that each whale killed produced very large quantities of fine oil and bone. The seasonal migration, in turn, dictated when and where vessels could operate, and severely reduced stocks during the eighteenth and nineteenth centuries made a thorough knowledge of the resource an absolute prerequisite of a successful Northern whaling master. An engineer on a Dundee whaling steamer observed in 1861, "vessels in this trade it is well known, require for a chance of success, to reach a certain place, by a given date."[53] Thus even in the age of steam the habits and nature of the Greenland Right whale still determined the character and organization of the industry.

53. Journal kept by A. Smith, engineer aboard *Camperdown*, 1861, p. 90. Dundee Public Library.

Table 1

Whaling Results of Ten Scottish Sailing Vessel Voyages Between 1830 and 1853:
Size of Baleen When Provided (not including sucklings*) at Davis Strait and Greenland

May	June	July**		August***	September	October
10 ft., 6 in.		12 ft., 0 in.	6 ft., 1 in.	10 ft., 0 in.	9 ft., 9 in.	10 ft., 5 in.
10 ft., 0 in.		8 ft., 6 in.	9 ft., 7 in.	9 ft., 2 in.	11 ft., 3 in.	11 ft., 7 in.
12 ft., 0 in.		8 ft., 6 in.	10 ft., 0 in.	8 ft., 3 in.	9 ft., 5 in.	
10 ft., 6 in.		10 ft., 0 in.	9 ft., 4 in.	8 ft., 0 in.	9 ft., 5 in.	
10 ft., 0 in.		6 ft., 10 in.	9 ft., 2 in.		11 ft., 3 in.	
10 ft., 4 in.		6 ft., 4 in.	10 ft., 0 in.		10 ft., 4 in.	
11 ft., 0 in.		7 ft., 6 in.	9 ft., 0 in.		10 ft., 0 in.	
10 ft., 6 in.		10 ft., 2 in.	9 ft., 0 in.		11 ft., 7 in.	
		7 ft., 6 in.	9 ft., 0 in.			
		8 ft., 3 in.	9 ft., 0 in.			
		10 ft., 8 in.	9 ft., 4 in.			
		8 ft., 9 in.	11 ft., 5 in.			
		9 ft., 0 in.	10 ft., 6 in.			
		6 ft., 9 in.	6 ft., 0 in.			
		10 ft., 0 in.	10 ft., 3 in.			
		8 ft., 0 in.	10 ft., 0 in.			
		9 ft., 0 in.	9 ft., 0 in.			
		10 ft., 1 in.				
Average size by month						
10 ft., 6 in.	-	9 ft., 0 in.		8 ft., 9 in.	10 ft., 4 in.	11 ft., 0 in.

Average Size for All Whales = 9 ft., 7 in.
Average Number of Whales per Voyage = 5.7
(for whales measured)

* under 6 ft.
** also 3 sucklings
*** also 4 sucklings
Source: Log-books (Various)

Table 2

Whaling Results of 16 Scottish Steamer Vessel Voyages Between 1885 and 1900:
Size of Baleen When Provided (not including sucklings*) at Davis Strait

May	June	July**	August	September	October
10 ft., 2 in. 10 ft., 6 in. 10 ft., 9 in.	10 ft., 2 in. 10 ft., 0 in. 10 ft., 5 in.	9 ft., 4 in. 9 ft., 2 in. 11 ft., 2 in. 11 ft., 2 in. 10 ft., 8 in. 11 ft., 8 in. 11 ft., 6 in. 8 ft., 10 in.	10 ft., 2 in. 10 ft., 10 in.	11 ft., 9 in. 13 ft., 4 in. 11 ft., 1 in. 10 ft., 9 in. 10 ft., 10 in. 9 ft., 8 in. 10 ft., 4 in. 10 ft., 5 in.	11 ft., 4 in. 9 ft., 6 in. 9 ft., 7 in. 11 ft., 2 in. 10 ft., 7 in.
Average size by month					
10 ft., 5 in.	10 ft., 2 in.	10 ft., 4 in.	10 ft., 5 in.	11 ft., 2 in.	10 ft., 4 in.

Average Size for All Whales = 10 ft., 6 in.

Average Number of Whales per Voyage = 1.8
(for whales measured)

* under 6 ft.
** also 3 sucklings

Source: Log books (Various)

Table 3

Comparison of Nineteenth Century Scottish Sailing Vessel and Steamer Results:
Size of Baleen When Provided (not including sucklings*)** at Davis Strait and Greenland

Average Size by month	May	June	July	August	September	October
Sailing Vessel	10 ft., 6 in.	-	9 ft., 0 in.	8 ft., 9 in.	10 ft., 4 in.	11 ft., 0 in.
Steamer	10 ft., 5 in.	10 ft., 2 in.	10 ft., 4 in.	10 ft., 5 in.	11 ft., 2 in.	10 ft., 4 in.

	Average size for all whales	Average No. of Whales per Voyage***
Sailing Vessel	9 ft., 7 in.	5.7
Steamer	10 ft., 6 in.	1.8

* under 6 ft.
** See Tables 1 and 2 for specific details
*** For whales measured

Source: Log books (Various)

Table 4

Sex and Size of Greenland Right Whales Captured by S.S. *Arctic* During 1873 Whaling Voyage

Date	Whaling Ground	Sex		Length of Whalebone	
		M	F	Feet	Inches
May 23	Southwest Ground	x		9	7
June 15	Off Pond Inlet		x	5	4
June 15	Off Pond Inlet	x		5	6
June 15	Off Pond Inlet		x	3	5
June 15	Off Pond Inlet	x		7	0
June 19	Entrance to Lancaster Sound		x	11	7
June 23	Entrance to Lancaster Sound		x	8	6
June 23	Entrance to Lancaster Sound	x		7	0
June 24	In Lancaster Sound		x	10	4
June 25	In Lancaster Sound	x		8	10
June 28	Off Prince Regent Inlet		x	9	2
June 30	Off Prince Regent Inlet		x	6	5
June 30	Off Prince Regent Inlet		x	10	4
June 30	Off Prince Regent Inlet	x		2	6
June 30	Off Prince Regent Inlet	x		4	0
July 5	In Barrow Straits		x	11	9
July 5	In Barrow Straits	x		6	6
July 5	In Barrow Straits		x	2	6
July 5	In Barrow Straits	x		2	6
July 6	In Lancaster Sound		x	7	0
July 9	In Baffin Bay	x		10	6
July 10	In Baffin Bay	x		11	0
July 13	In Baffin Bay	x		9	6
July 20	In Lancaster Sound	x		5	3
July 29	In Prince Regent Inlet		x	10	0
August 1	In Prince Regent Inlet	x		6	9
August 9	In Prince Regent Inlet	x		8	6
August 11	In Prince Regent Inlet		x	10	2

Notes: i) No fall fishery because of good spring and summer catches.
ii) During the voyage Captain Adams was operating at the maximum penetration of the Canadian Archipelago achieved by the Scottish whaling fleet. The dangerous nature of this practice is demonstrated by the fact that the *Arctic* was lost in Prince Regent Inlet during the following season while attempting to duplicate the success of this voyage.

Source: After A. H. Markham, *A Whaling Cruise to Baffin's Bay: And an Account of the Rescue of the Crew of the "Polaris,"* (London, 1874).

Appendix A

The following log books, journals, and related publications, in the archives of Broughty Castle Museum, Dundee (BCM), Dundee Public Library, Dundee (DPL), Glasgow University Library, Glasgow (GUL), Kirkcaldy Public Library, Kirkcaldy (KPL), Peterhead Public Library, Peterhead (PPL), Scottish Fisheries Museum, Anstruther (SFM), and University Library, King's College, Aberdeen (ULKC), were used in the preparation of Tables 1-3 and Figures 3-7 and 10.

Active 1853 Peterhead. Sail; Captain David Gray; East Greenland; Journal kept by J.B. Arbuthnot, passenger; PPL.

Alexander 1825 Aberdeen. Sail; Captain Fairburn; East Greenland; Journal kept by Thomas Scoresby, second mate, son of Wm. Scoresby, Jr.; ULKC (Microfilm).

Aurora 1893 Dundee. Steam; Captain McKay; Newfoundland and Davis Strait; Journal kept by Dr. J.W. Allen, medical officer, and titled "On Board the 'Aurora' in '93. The Record of a Sealing and Whaling Voyage"; GUL.

Caledonia 1834 Kirkcaldy. Sail; Captain Gray; Davis Strait; SFM.

Chieftain 1841 Kirkcaldy. Sail; Captain R. Tod; Davis Strait; Log book kept by D. Kerr, first mate; KPL.

Chieftain 1842 Kirkcaldy. Sail; Captain R. Tod; Davis Strait; Log book kept by D. Kerr, first mate; KPL.

Chieftain 1852 Kirkcaldy. Sail; Captain W. Archibald; Davis Strait; KPL.

Diana 1898 Dundee. Steam; Captain Adams; Davis Strait; BCM.

Dorothy 1834 Dundee. Sail; Captain D. Davidson; Davis Strait; DPL.

Eclipse (1) 1852 Peterhead. Sail; Captain J. Gray; East Greenland; Journal kept by J.B. Arbuthnot, a passenger, and titled "Journal of a Voyage to the Greenland Seal and Whale Fishing"; PPL.

Eclipse (2) 1893 Dundee. Steam; Captain Milne; Davis Strait; BCM.

Eclipse (2) 1896 Dundee. Steam; Captain Milne; Davis Strait; BCM.

Eclipse (2) 1897 Dundee. Steam; Captain Milne; Davis Strait; BCM.

Esquimaux 1885 Dundee. Steam; Captain Milne; Newfoundland and Davis Strait; BCM.

Esquimaux 1886 Dundee. Steam; Captain Milne; Newfoundland and Davis Strait; BCM.

Esquimaux 1887 Dundee. Steam; Captain Milne; Newfoundland and Davis Strait; BCM.

Esquimaux 1888 Dundee. Steam; Captain Milne; Newfoundland and Davis Strait; BCM.

Esquimaux 1891 Dundee. Steam; Captain J. Phillips; Newfoundland and Davis Strait; Log book kept by W. Stenhouse, first mate; BCM.

Esquimaux 1895 Dundee. Steam; Captain Adams; Davis Strait; BCM.

Esquimaux 1899 Dundee. Steam; Captain H. McKay; Davis Strait; Journal kept by A.B. Walker, principal financial backer of the trip, and used as the basis for the book, "Cruise of the Esquimaux," published in 1906; BCM.

Esquimaux 1900 Dundee. Steam; Captain H. McKay; Newfoundland and Davis Strait; Log-book kept by R. Davidson, first mate; BCM.

Fairy 1838 Dundee. Sail; Captain D. Davidson; Davis Strait; DPL.

Hercules 1822 Aberdeen. Sail; Captain T. Fairburn; Published in Scoresby, W. Jr., *Journal of a Voyage to the Northern Whale-Fishery; Including Researches and Discoveries on the Eastern Coast of West Greenland, made in the Year of 1822, in the Ship Baffin of Liverpool* (Edinburgh: Archibald Constable, 1823).

Hercules 1831 Aberdeen. Sail; Captain Allan; Davis Strait; Journal kept by medical officer; ULKC.

Jan Mayen 1865 Peterhead. Sail; Captain R. Martin, Jr.; East Greenland; Account written from rough notes by J. Wilson, crewman; PPL.

Jan Mayen 1866 Peterhead. Sail; Captain R. Martin, Jr.; East Greenland; Account written from rough notes by J. Wilson, crewman; PPL.

Leviathan 1822 London. Sail; Captain Shafton; Journal kept by paying passenger R. P. Gilles, *Tales of a Voyager to the Arctic Ocean*, vols. 1-3 (London: Henry Colburn, 1826).

Maud 1891 Dundee. Steam; Captain Milne; Davis Strait; BCM.

Maud 1892 Dundee. Steam; Captain Milne; Davis Strait; Lost in heavy ice off Coutt's Inlet on October 10th, crew rescued; BCM.

North Pole 1837 Leith/Edinburgh. Sail; Captain J. Lyle; East Greenland; DPL.

Polynia 1890 Dundee. Steam; Captain Milne; Davis Strait; BCM.

Princess Charlotte 1853 Dundee. Sail; Captain G. Deuchars; Davis Strait; DPL.

Sir Colin Campbell 1864 Peterhead. Sail; Captain R. Birnie; East Greenland; Account written from rough notes by J. Wilson, crewman; PPL.

Thomas 1833 Dundee. Sail; Captain Thoms; Davis Strait; Journal (incomplete) kept by medical officer; BCM.

William and Ann 1830 Leith/Edinburgh. Sail; Captain Smith; Davis Strait; SFM.

Dr. Chesley W. Sanger is a professor of geography and a member of the Maritime Studies Research Unit at Memorial University of Newfoundland. He has published articles on whaling and seal fishing, both in Scotland and in Newfoundland and Labrador, in The International Journal of Maritime History, The Northern Mariner, Polar Record, Newfoundland Studies, *and* Scottish Geographical Magazine. *His recently completed book on the origins and evolution of European based commercial whaling has been accepted for publication by Breakwater Press.*

Naval Lessons of the Great War: The William Sims-Josephus Daniels Controversy

PAOLO E. COLETTA

IN the early months of 1920, what might have been a relatively minor Senate subcomittee hearing turned into a controversial reexamination of U. S. naval administration during the First World War. Initially, a subcommittee of the Senate Naval Affairs Committee met to discuss whether Secretary of the Navy Josephus Daniels was correct in changing the recommendations for awarding medals for outstanding wartime service. Soon, however, it was debating both Daniels's conduct of the war and the larger question of civilian vs. military authority in the U. S. Navy.

Admiral William S. Sims, who had served as commander of American naval forces in Europe during World War I, led the attack on Daniels. Assisting him was his friend and Republican subcommittee chair Frederick Hale. On the second day of the hearings, Hale suddenly asked Sims to submit "any further correspondence with the Secretary of the Navy about the question of awards and their effect on the morale of the service." Sims's response was to produce from his pocket a letter he had written to Daniels on January 7 of that year, and which had already been leaked to the press, on the question, he said, "of the morale of the service." It was an example of what Sims's biographer, Elting E. Morison, called his inability to tell the difference "between rapping for attention and knocking his audience cold,"[1] for rather than dealing with medal awards, it concerned "Certain Naval Lessons of the Great War."[2] After reading the letter, Hale obtained authority from the Senate Naval Affairs Committee to investigate the various charges it contained against the Navy Department, and he opened hearings on March 9.[3]

On January 28, 1919, Sims had criticized a report, dated November 15, 1918, that Assistant Chief of Naval Operations Captain William V. Pratt had written to Daniels during the absence of the Chief of Naval Operations (CNO), Admiral William S. Benson, in Paris. Pratt's report, published as the Navy's *Annual Report* in 1919, contained an addendum which listed recipients of medals awarded for wartime service. But Sims refused the Distinguished Service Medal awarded him. Were he to reveal the cablegrams exchanged with the Department during the first four months of the war, he said, he would make the report look "sick."[4]

In his very long letter of January 7, 1920, Sims documented errors of policy, tactics, strategy, and administration which he said had been made by the Navy Department during the war. He charged, for example, that during the neutrality period, 1914-1917, the Department prepared neither plans nor policies for war and did not announce a policy until July 1917, three months after the nation went to war. In consequence of these omissions, of the faulty organization of the Department, and of the unpreparedness of the fleet, the Navy "failed, for at least

1. Elting E. Morison, *Admiral Sims and the Modern American Navy* (Boston: Houghton Mifflin, 1942), p. 338.

2. According to Daniels, ". . . Sims virtually indicted the whole Navy Department. I gave the letter to [Admiral William S.] Benson [wartime Chief of Operations] as it particularly roasted Operations." Daniels Diary, January 14, 1920, in Josephus Daniels papers, Manuscript Division, Library of Congress (hereafter cited as MDLC).

3. *Naval Investigation Hearings Before the Subcommittee of the Committee on Naval Affairs, United States Senate*, 66th Cong., 2d sess., 2 vols. (Washington: Government Printing Office, 1921) 1:1-9, 272-75 (hereafter cited as NIH); Tracy Barrett Kittredge, *Naval Lessons of the Great War: A Review of the Senate Naval Investigation of the Criticism by Admiral Sims of the Policies and Methods of Josephus Daniels* (Garden City, NY: Doubleday, Page, and Company, 1921), pp. 41-73; Morison, *Sims*, pp. 442-45. The members of Hale's committee were L. Heisler Ball (R-DE), Henry W. Keyes (R-NH), Key Pittman (D-NV), and Park Trammel (D-FL).

4. Gerald E. Wheeler, *Admiral William Veazie Pratt, US Navy: A Sailor's Life* (Washington: Department of the Navy, Naval History Division, 1974), pp. 147-49.

Rear Admiral William S. Sims (center) is pictured here with Rear Admiral Josiah S. McKean, wartime Assistant for Material in the Office of the CNO, and Assistant Secretary of the Navy Franklin D. Roosevelt. On the wall is the painting *Return of the Mayflower* by B. F. Gribble, a gift from Admiral Sims to the Navy Department. Photo courtesy of the U. S. Naval Institute.

six months, to throw full weight against the enemy." Furthermore, said Sims, during the most critical months of the U-boat campaign, April to October, 1917, the Department had violated the fundamental strategical principle of concentration of maximum force in the critical area of the conflict, the Western Approaches to the British Isles. Without the complete information he alone could furnish from London, Sims continued, the Department had made decisions and drafted plans that could not be carried out, and had also failed to cooperate wholeheartedly with the Allies. In his opening statement to the committee, moreover, Sims charged that, because of its unpreparedness for war and dilatoriness for the first six months at war, the Department had "cost the Allied cause 2,500,000 tons of shipping, 500,000 lives, and $15,000,000,000."[5]

5. Sims's letter is printed in NIH, 1:1-9.

Suspecting that Sims wished to force him from the cabinet and to create a general staff for the Navy, Daniels did not plan to counter him point by point. Instead, he planned to attack Sims both personally and politically in keeping with advice from the widowed Mrs. Mildred Dewey to "Give them hell. That is the message George Dewey would have given you if he were here."[6] So Daniels recalled Benson to active duty to prepare his testimony and directed the bureau chiefs and others to prepare reports on their wartime activities. Sims, in the

6. Josephus Daniels, *The Wilson Era: Years of War and After — 1917-1923* (Chapel Hill, NC: University of North Carolina Press, 1946), p. 502. Various studies which Daniels used to refute Sims's charges remain in "Senate Investigation of the Navy Department," Daniels Papers, Boxes 452-72. Daniels had also read the articles in *The World's Work* which later appeared in *Victory at Sea*, written by Sims with Burton J. Hendrick (New York: Doubleday, Page, and Company, 1920).

meantime, had a coterie of naval officers and journalists seek to shape public opinion in his favor.

While admitting that mistakes had been inevitable in a Navy engaged at war, Daniels asserted that "Only one thing really counts in this great world and that is the result."[7] The transportation of more than two million men to France alone was answer enough to most of Sims's criticisms. If these statements failed to bear upon Sims's charges, Daniels's next ones hit center. He declared first that Sims's letter of January 7 had no bearing on the question of awards.[8] Second, he said that publication of the letter violated *Navy Regulations* and naval traditions and that it should have gone to the General Board, which would have considered it with other letters bearing on the conduct of the war. Even if Sims demanded a postmortem examination of the war so that mistakes made therein could be avoided in the future, Daniels did not relish being forced to display his dirty laundry to the world.[9]

Daniels's criticism of Sims for not measuring up to expectations during the war made good newspaper headlines but did not answer Sims's charges.[10] Then Daniels further charged that Sims had an exaggerated idea of his position. Although Sims was the commander of American naval forces in Europe and had personal charge of ship operations in France, British officers directed his ships' operations in British waters. Furthermore, said Daniels, ". . . his real function was that he was in substance an assistant abroad to the Chief of Naval Operations," Admiral Benson.[11] Benson and his staff, not Sims, had directed naval operations and produced victory. Daniels further charged that Sims had deceived the Department by saying he supported its decisions, then criticizing its lack of support for him.[12]

Daniels also thought that Sims had erred by demanding a larger staff. Since Sims was not involved in fighting, all he had to do was to send the Department information he gathered, offer recommendations, and carry out instructions. Although Sims had but one aide, the staff of the American naval attaché in London provided help, and he could hire civilian assistants. While denied the right to commission untrained American youths abroad who might seek refuge in shore duty, Sims was promised "every facility which the personnel and material conditions of the Navy permit."[13] Daniels asserted that Sims had compounded his error by asking by name for Captain Pratt, Benson's assistant, and other men vitally needed on Benson's staff and that of Admiral Henry T. Mayo, Commander in Chief, Atlantic Fleet. Under the circumstances, said Daniels, Sims could not be given "a big staff of experienced officers sorely needed here to do more important work than was then necessary to do in London at that time."[14]

Sims complained that he was not permitted to name men who supported his policies and methods as his subordinate flag officers. He claimed that Daniels had sent men who were loyal instead to Department policies. Among these were some men who had achieved high rank by seniority and, although efficient in handling ships in a fleet action, knew little about antisubmarine warfare. These officers reported via Sims to their common superior, Mayo, not to Sims as commander in chief, for he was merely a liaison officer. Daniels felt that the results proved that no mistake was made in selecting the officers and that Sims was wrong in charging that the Department had departed from sound military policy in not giving him the powers of a commander in chief.[15] Whether the

7. NIH, 1:1982.

8. Ibid., 2:1990-91. See also Daniels, Diary, March 9, 1920.

9. That Sims had long held his fire against the Department is evident from his writing William V. Pratt on August 13, 1918, that a history of the war would reveal a number of features "that will not be very creditable to the United States Navy." According to Sims, the war was being fought with most of the experienced personnel "on the side of the ocean where there is no war." In consequence, he had to rely heavily on inexperienced Reserve Officers. He praised Pratt for seeking to establish a staff system in Benson's office but wondered why "the Navy Department should have watched a war for three years and been in the war for one-and-a-half years without having organized a practical piece of machinery to carry out its work." William S. Sims Papers, MDLC. The war also revealed deficiencies in the Royal Navy in material, tactical doctrine, and command system. Instead of displaying their dirty linen to the world, the Admiralty quietly adopted reforms suggested by special investigations into the Gallipoli campaign and into postwar ships and aircraft. Arthur Marder, "The Influence of Sea Power: The Royal Navy and the Lessons of 1914-1918," *Pacific Historical Review* 41 (November, 1972): 413-43.

10. Daniels's charges are found in NIH, 2:1984, 2644-47, and Daniels, Diary, November 27, 1917, January 31, February 2, and May 13, 1918.

11. NIH, 2:1995.

12. Ibid., 2:1995-98.

13. Ibid., 1:1998-2000. See also Morison, *Sims*, pp. 367-71, 400-1.

14. NIH, 2:2001-03. "Broke up Operations several times to help Sims," Daniels, Diary, March 8, 1920. Although Pratt assured Sims that he could not be spared from Benson's office, Sims continued to ask that he be sent over, noting on June 17, 1917, that he had made the request six times to date. Pratt to Sims, May 6, 1917, Sims to Pratt, June 7, 1917, Sims Papers. Sims could logically question why Mayo, his fleet safe in the Chesapeake Bay, could not spare officers for him. Daniels, Benson, and Mayo believed just as logically that the fleet must be kept intact in case it had to fight the German fleet or its destroyers hunt U-boats off the East Coast, and that its officers provided extremely valuable service in providing gunnery training for men who would then be transferred to merchant ships and warships as armed guard crews.

15. Daniels, Diary, August 18, 1917.

placing of sympathetic flag officers under Sims would have shortened the war by six months is, of course, debatable.

During the American neutrality period, President Woodrow Wilson had denied Navy Department requests that naval observers be sent to England and the continent to study the war at first hand. He approved only defensive measures designed to defend the Western Hemisphere from U-boats or from the German High Seas Fleet if it defeated the British Grand Fleet.

Daniels agreed that Sims sent the Department important information. However, it obtained even more intelligence on what to do in all war areas from daily conferences with the many Allied representatives in Washington and from American naval commanders in Europe other than Sims. The Department was thus able to understand the current and postwar missions of the American Navy better than Sims could determine from London, for Sims had only a restricted naval point of view — one reason why President Wilson originally considered him such an Anglophile that he could reach no decisions of his own. Daniels, on the other hand, had a larger view. When Sims had asked that battleships be sent to Europe for moral effect, for example, Daniels had said, "NO: not without a program," meaning not until the British had agreed to grant the United States at least naval parity in the postwar era.[16] It was Sims's restricted outlook and Anglophilism, Daniels added, that caused President Wilson to choose Benson — conservative by nature and deliberative by habit — rather than Sims as his naval adviser at Paris following the war.[17]

The Navy Department had cooperated perfectly with the British Navy throughout the war, said Daniels. For example, Sims was sent to London before the United States declared war on April 6, 1917, and on the next day arrangements were made to confer with British and French

Josephus Daniels, Secretary of the Navy from 1913 to 1921. Photo courtesy of the U. S. Naval Institute.

naval leaders in American waters. Conferences held on April 10 and 11 had resulted in several decisions: first, that the United States would relieve Britain and France of patrolling the American coast from Halifax to Brazil; second, that it would send a division of destroyers to help in the "protection of commerce near the coasts of Great Britain and France"; and third, that it would "assist naval operations of entente powers in every way possible."[18] Moreover, cooperation had been firm and close. None of the British admirals and government officials Daniels had spoken with at home and in Europe admitted Sims's charge that the American Navy had prolonged the war by six months.[19] Sims further charged that the Navy Department had very belatedly adopted a wartime policy, but Daniels brushed that charge aside by stating that the policy statement he had sent Sims on July 10, 1917, was merely

16. Shortly after the United States entered the war, Daniels offered the British as many battleships as they could operate with their fleet. However, with the chief menace at the time being the U-boat, destroyers were sent instead. After the Battle of Jutland, the British did not need a large capital ship fleet. Daniels therefore kept his battleships at home in order to save oil needed by submarine hunters and the Army. However, just in case the Germans tried to offer battle, he sent over the coal-burning Sixth Division of dreadnoughts. Daniels, Diary, June 22, July 2, 6, 24, November 10, 11, 1917, April 15, 1918, and *Wilson Era*, p. 117.

17. NIH, 2:1005-06. See also Daniels, *Wilson Era*, pp. 48-61, 370. Sims's Anglophilism was also apparent in his willingness to take advantage of lessons the British had learned in three years of war, amalgamate American with British troops, and concentrate efforts against U-boats in Britain's Western Approaches even at the risk of slighting the U. S. Fleet, and in his refusal to criticize the British for not taking aggressive action against U-boat bases in Flanders.

18. NIH, 2:2005-06. For a more extended discussion of promised cooperation, see Daniels, Diary, April 7, 9, 11, and 16, 1917, and *Wilson Era*, pp. 79-82.

19. NIH, 2:1981-2819, passim. See also *Annual Report of the Secretary of the Navy, 1918* (Washington: GPO, 1918), pp. 169-73..

Admiral William S. Benson, USN, Chief of Naval Operations (CNO) during World War I. Photo courtesy of the U. S. Naval Institute.

a summary of policies already in effect, of which Sims was well-apprised.[20]

Daniels then laid heavy stress on steps taken to prepare the Navy for war. He mentioned the continuing program of ship construction he had advocated in July 1915, which laid the foundation for the naval bill of August 1916. That bill in turn provided for the personnel needed to man new ships. Second, he noted that Assistant Secretary of the Navy Franklin D. Roosevelt had sent the President a plan for a North Sea Mine Barrage as early as October 1916.[21] On February 23, 1917, the President himself had asked why the British did not use convoy; on March 6, he had suggested methods of fighting submarines; and on March 20, he had urged the adoption of convoy if the United States went to war.[22] Soon after the U. S. declaration of war, Wilson asked Daniels why the British did not "shut up the hornets in their nest?" (i.e., prevent U-boats from leaving their bases), and why they did not convoy their merchant ships.[23] On July 4, moreover, Wilson had written Sims that British anti-submarine methods did not seem efficacious, and that Sims should forward his own recommendations. On August 11, Wilson had suggested audaciously offensive rather than merely defensive measures against U-boats, including the sacrifice of half of the American and British navies if necessary to assure the destruction of U-boats in their well-fortified pens.[24]

Sims had replied to Wilson's letter of July 4 by saying that both British and American antisubmarine plans were "impracticable," that virtually all American naval authority should be transferred to him at London, that he should be given a larger staff, and that "regardless of future developments," the United States could "always count on the support of the British Navy."[25] Sims opposed not only the enlargement of the American merchant marine, on the ground that Britain would provide America's shipping needs, but also the creation of a postwar American navy equal to Britain's, because "England has protected us upon the seas and we could always rely upon her to do so."[26] That Canadian-born Sims favored Britain over the United States was amply clear to Daniels.[27]

"If Admiral Sims originated a single one of the important policies or first suggested one important measure the United States Navy put into effect during the

20. NIH, 2:2001-18, 2819.

21. Edward Budd Parsons, "Admiral Sims's Mission in Europe in 1917-1919 and Some Aspects of United States Naval and Foreign Wartime Policy" (Ph.D. diss., State University of New York at Buffalo, 1971; Ann Arbor, MI: University Microfilms, 1971), p. 90.

22. Daniels, Diary, February 25, March 6, 20, 1917.

23. Ibid., July 2, 3, 1917; Daniels, *Wilson Era*, p. 41; Wilson to Sims, July 4, 1917, in NIH 2:2080-81.

24. NIH, 2:1018-23; Daniels, Diary, August 16, 1917, and *Wilson Era*, pp. 27-28, 41-45, 83. British use of 3,000 destroyers and auxiliary patrol vessels — or twenty-seven hunters for every U-boat — had until mid-1917 provided no answer to the U-boat problem. A major error was in seeking to keep sea lines of communication open by having ships patrol them rather than protecting merchant ships themselves. When Sims called on Admiral John R. Jellicoe, commanding the Grand Fleet, on April 10, 1917, Jellicoe confessed that there was absolutely no solution in sight. Sims thereupon cabled Washington that the situation was desperate and requested the sending of destroyers, light craft for inshore antisubmarine work, more merchant tonnage, and logistic support craft, but he also advised Jellicoe to adopt convoy. Sims to Secretary of the Navy (Operations), April 14, 18, and 19, 1917, Sims Papers. After studies proved that convoy was practicable, the Admiralty agreed to experiment with it. Found very suitable, it was adopted for all incoming and outgoing ships by midsummer 1917.

25. NIH, 2:2081.

26. Ibid., 2:2084. See also Daniels, *Wilson Era*, pp. 345, 370-1.

27. NIH, 2:2083.

war, I cannot recall it," said Daniels.[28] Further, the Department had selected Sims to be its representative in Europe despite several blotches on his career. He had a long record as a Young Turk, or radical reformer, who had demanded a naval general staff and the centralization of authority in a single professional officer. President Roosevelt had tolerated Sims's indiscretions, but President Taft had reprimanded him for Anglophile statements made in England in 1910. In addition, Sims had earned a separate reprimand for being "insubordinate in character [and] disrespectful to the department and [the] commander-in-chief."[29]

Daniels strenuously denied the charge that he had opposed adopting the convoy system, but ambivalence marred his subsequent lengthy exposition. Convoying was considered by the Navy Department before it decided to send Sims abroad, and Daniels had told Sims before the latter went to London that the President had been among the first to suggest its adoption.[30] The war was three years old before the British Admiralty adopted convoy in principle for all merchant shipping, on May 1, 1917, and the Admiralty did not implement a full convoy system until the end of the year.[31] As late as June 20, 1917, Daniels had supported Benson, who opposed large convoys because their escorting destroyers must come from Mayo's fleet. While he said his own mind had always been open to suggestion, Daniels did not reveal his belief that armed guard crews on merchant ships could deal with U-boats better than convoy escorts. In any event, as soon as Benson noted the success of five convoys that sailed in June and approved convoying, Daniels had provided the escorts.[32]

Daniels made the admiral look like a human monster by revealing that Sims's letter had said it was more important to escort cargo ships than troop transports. With the slaughter on the Western Front averaging five thousand men a day, Sims had said, it made little difference if the Germans sank some troopships and killed fifteen or twenty thousand men. Because the number of Americans in Europe was increasing, Allied forces had to be assured of supplies, and the number of merchant ships and destroyers was finite. If supply ships were lost, men could not fight. Although Sims thought as the Germans did — the Germans left the transports alone and concentrated on supply ships — Daniels had enough political sense to remind Sims that American escorts must be used for transports "on account of the present sensitive public opinion," and he could point to the loss of three empty transports because they had been unescorted.[33] With respect to convoy schedules, however, Daniels swallowed his patriotic pride and adopted those furnished by the Admiralty.[34]

The North Sea Mine Barrage was another cause of dispute between Daniels and Sims. Daniels blamed the delay of six months (from April 15 to October 23, 1917) in winning British agreement to lay the barrage upon the British and Sims, who viewed the project as technically impossible and looked upon minefields, antisubmarine nets, and similar methods as mere palliatives.[35] Sims objected to the barrage because he believed, first, that convoy was checking the U-boat threat, and second, that the barrage must be made impervious to the boats. Instead of the barrage, Sims had suggested increasing the number of destroyers to patrol a huge submarine danger area he

28. Ibid., 2:2085. Daniels noted that his department had arranged for cooperation with the British before Sims was sent over. It had relieved British and French ships in American waters; sent twenty-eight destroyers and two destroyer tenders and planned to send eight more destroyers; provided escorts for the large traffic moving through the Straits of Gibraltar; had Sims shift some of his destroyers from Ireland to Brest, France; sent ships to the Azores to preempt their use by Germans; and operated the Naval Overseas Transport Service. In addition, it had provided shipping and supplies for American and Allied naval forces in Europe; provided 14-inch naval railway batteries for use in France; planned to send a large aviation corps across; armed American merchant ships; and sent Marines to fight in France.

29. NIH, 2:2085-87. Admiral Henry B. Wilson had originally been tapped to go to London. However, after Daniels directed him to command a coastal defense force, the nod went to Sims. The adverse comments about Sims had been written by Benson on his fitness report for 1916. William S. Benson Papers, MDLC, used by permission of Benson's son, Commodore Howard Benson, USN (Ret.).

30. NIH, 2:2157-58. See also Daniels, Diary, July 6, 1917, and *Wilson Era*, pp. 67-68.

31. That the British put little emphasis on antisubmarine work in the Western Approaches is evident from the fact that they kept ninety-nine destroyers with the Grand Fleet, thirty-seven with the Dover Patrol, forty-four at Devonsport, and only eight at Queenstown.

32. On July 6, 1917, Sims had written to Benson: "I think that there is no question but that you should place the responsibility of the safe passage of these convoys in the danger areas *on the man who must protect them in those areas*, and therefore, I have stated clearly what I consider is necessary, and if you wish to hold me responsible, I should say the best thing to do is to take my plan and then be prepared to kill me if it does not work (emphasis in the original)." Benson Papers. See also Joseph Morrison, *Josephus Daniels: The Small-d Democrat* (Chapel Hill, NC: University of North Carolina Press, 1966), pp. 83-84.

33. Secretary of the Navy to W. S. Sims, June 10, 1917, Sims Papers; NIH 2:2119-20; Morison, *Sims*, pp. 411-12, 418-23; Sims and Hendrick, *Victory at Sea*, Chapter 13.

34. Morison, *Sims*, pp. 357-58, 406-9.

35. On how the British produced and laid mines but had great difficulties in assuring their staying put or preventing their being swept, see NIH, 2:2034-37, and Julian S. Corbett and Henry Newbolt, *History of the Great War, Based on Official Documents: Naval Operations*, 5 vols. (London: Longmans, Green, 1920-1931), 4:379-82.

estimated to encompass twenty-five thousand square miles.[36] But upon learning of what Sims had written, President Wilson, in Daniels's words, "went up in the air." On July 4, 1917, Wilson wrote Sims so strongly about the need for "boldness, even at the cost of great losses," that Sims feared the President would replace him with another officer.[37]

Daniels was elated when, on July 8, 1917, the Bureau of Ordnance offered a plan for a barrage that included a new antenna mine much more powerful than the older horn type. Via Sims, he asked the Admiralty to send over an officer to test it. On August 15 Admiral Mayo was sent to London to present a plan in which the United States alone would provide, deliver, and lay the barrage, and in November, Benson went over in part to press the same plan.[38] Upon receiving a favorable report on the new mine, the British finally agreed to join in laying the barrage. But, said Daniels, "On April 13, the Navy Department had proposed the mine barrage, and on September 13 Sims says that the Admiralty proposed it."[39] Daniels then blasted Sims for having dissuaded Prime Minister David Lloyd George from pressing for the barrage, for recommending that all communications about it proceed through him rather than the Admiralty, and for trying to rob the United States of credit for it and give it to the British.

Sims's objections and the approach of winter postponed the laying of the barrage until 1918, and British failure to provide escorts for the minelayers doubled the time taken to lay the fields.[40] Furthermore, late in the war Sims had a rare personal dispute with the British Admiralty when he finally urged it to lay the barrage and acknowledged that its laying was "one of the wonders of the war" — even if it did not materially affect the war.[41] Estimates of how many U-boats it destroyed vary from a high of twenty-three to a low of three. But Daniels said it was well worth the cost, almost $80 million, because "a barrage which existed for only 6 percent of the period of the war caused a loss of 8.5 percent of the total number of submarines lost during the World War."[42] The barrage also kept German battle cruisers in port instead of raiding Allied commerce and transports, and so adversely affected the morale of the German Navy that it contributed to the mutiny that occurred there early in the fall of 1918.[43]

Most of Sims's testimony up to that point, said Daniels, had dealt with relatively minor matters. Much more important was the serious charge that the dilatoriness of the Navy had prolonged the war by six months and caused the unnecessary loss of half a million lives and expenditure of an extra $15 billion — a charge Daniels alleged that Sims had made with poor reasoning, faulty statistics, and "reckless disregard of the facts."[44] Troop transportation depended upon the allocation of American and Allied shipping. It took time to convert the 720,000 tons of interned German ships taken over by the United States, and it was not until after the Allies had stopped the great German land drives of the spring of 1918 that they could provide some extra tonnage. Furthermore, American troops could not be landed in France until other Americans had prepared French ports to handle large numbers of ships and men. Thus, neither the Army nor the Navy could be faulted. Sims said the American Navy caused unnecessary destruction of tonnage, but Daniels labelled the charge "fallacious." Since the United States had at best only 7 percent of the antisubmarine craft in the Western Approaches, that small percentage could not have shortened the war by six months. On this point, Daniels cited corroborating statements made by most of the naval witnesses who preceded him. But one may well ask whether destroyers taken from the Atlantic Fleet could not have so countered U-boats as to shorten the war.

Sims, Daniels went on, "did not recommend a single new, a single bold, a single audacious policy that was established or carried out by the Navy during the entire war."[45] Sims had recommended that the United States send the maximum number of destroyers and smaller craft for offshore and inshore patrol, some battleships for moral effect, cruisers for convoy escort, tugs for salvage, and merchant tonnage and antisubmarine escort craft. Daniels explained at great length why most of the recommendations were not followed, but he was not always convincing. For example, when asked if he had sent over all the destroyers possible, Daniels's answer was "No," for although thirty-six modern ones went over, fifteen remained as useless appendages to Mayo's fleet, behind

36. NIH, 2:2031-33.
37. Ibid., 2:2033-37.
38. "Naval Conference of 1917," Benson Papers, Box 42; Manny T. Koginos, "Admiral Benson and the First World War" (MA thesis, American University, 1960), pp. 39-65.
39. NIH, 2:2040. See also Daniels, *Wilson Era*, pp. 87-89.
40. NIH, 2:2026; Daniels, Diary, October 30, 31, 1917; Morison, *Sims*, p. 341.
41. NIH, 2:2046, 2062; Sims to Benson, August 30, October 11, 1918, Sims to Earl Wemyss, October 22, 1918, in U. S. Navy Department, Office of Naval Intelligence, Historical Section, *The American Naval Planning Section in London* (Washington: GPO, 1921), p. 493.
42. Daniels, *Wilson Era*, pp. 89-90.
43. NIH, 2:2047-67.
44. Ibid., 2:2173-74.
45. Ibid., 2:2190.

submarine nets in Chesapeake Bay. Daniels stated that he had ordered merchant ships and antisubmarine craft built "until the yards could build no more,"[46] but the antisubmarine ships were ordered so late that very few saw wartime duty. Between 1917 and 1922, 273 flush-deck destroyers were built and fitted with heavy gun and torpedo armament for fighting a fleet action. No antisubmarine weapons were installed in the ships as built, but depth charge racks and Y-guns were added to the few ships that were finished in time to serve during the war.

By early April of 1917, Sims had concluded that the major naval problem facing the Allies was how to protect their sea lines of communications from U-boats. Daniels had not adopted Sims's recommendations to send all antisubmarine craft across, lest some U-boats appear off the East Coast — as two did in May 1918 and several others thereafter — but Sims had anticipated this action and written to Pratt that Germany would send some boats over for the strategic purpose of tying destroyers to Mayo's fleet instead of engaging in convoy escort. Sims felt that miscellaneous coastal yard craft could fend off these U-boats. Yet Daniels had a point when he asked why the British removed the few antisubmarine craft they kept in the critical Western Approaches when American destroyers arrived at Queenstown (now Cobh), Ireland. To Sims's suggestion that the planning division of the Navy Department be moved bodily to London, thus leaving the Department to serve only as a supply coordinating organization,[47] Daniels replied sulfurously: "We were charged with the administration of the Navy, not a Simsian Navy. Congress had not authorized us to move the Navy Department from Washington to London, nor had it provided that it be made an appendage of Sims or a branch of the British Admiralty."[48] In November of 1917, however, the Department had sent Sims three officers as a nucleus of a Planning Section that would cooperate with the British Admiralty.

Sims made much of the lack of war plans by the Department. He was wrong, said Daniels, because since 1915 the General Board had updated its war plans with an eye on the war in Europe. The Department's thirteen plans had addressed such matters as mobilization, organization, command, strategy, bases, advance bases, logistics, naval districts, and how the United States could cooperate with the Allies if it went to war.[49] The Department had also required reports from all bureaus on their status of preparedness and "increased personnel, efficiency, and material more than in any similar peace period. . . ."[50] The grades of admiral and of vice admiral were created; every navy yard was made ready to build ships; funds were granted to aeronautics; a mine division was established; and weapons supplies were increased. Daniels did admit, however, that "It is the shortage of officer personnel during the time of peace on duty at headquarters that is mainly responsible for any lack of preparedness, efficiency, or modernness of our Navy. . . ."[51]

Well aware of Sims's major purpose in writing his letter of January 7, Daniels stated: "It cannot have escaped members of this committee that running like a thread through [Sims's testimony] has been an advocacy of a General Staff for the conduct of the American Navy, and the elimination of civilian control . . . ."[52] The charge should be amended to read that while Sims acknowledged civilian control over the military, he felt that naval line officers should be authorized to handle war planning, preparing for war, and wartime operations.[53] Had Daniels instituted a general staff, Sims held, he would have had to listen to advice from his chief professional advisers. Both Daniels and Sims were astounded by Benson's assertion that the CNO should have authority commensurate with his responsibilities. In addition to having control over the bureaus, he should be kept informed of administration policies.[54]

46. Edward N. Hurley, *The Bridge to France* (Philadelphia and London: J. B. Lippincott Company, 1927). See also Captain Thomas G. Frothingham, USR, *The American Reinforcement in the World War* (Garden City, NJ: Doubleday, Page, 1927); Rear Admiral Albert Gleaves, USN, *A History of the Transport Service* (New York: George H. Doran Company, 1921); William N. Thurston, "Management-Leadership in the United States Shipping Board, 1917-1918," *The American Neptune* 32 (July, 1972): 155-70.

47. NIH, 2:2195-96. See also Daniels, *Wilson Era*, pp. 143-48; Morison, *Sims*, p. 411.

48. NIH, 2:2781.

49. General Board to Secretary of the Navy, February 24, 1917, GB No. 425, Serial No. 666; General Board to Secretary of the Navy, March 21, 1917, GB No. 425, Serial No. 689.

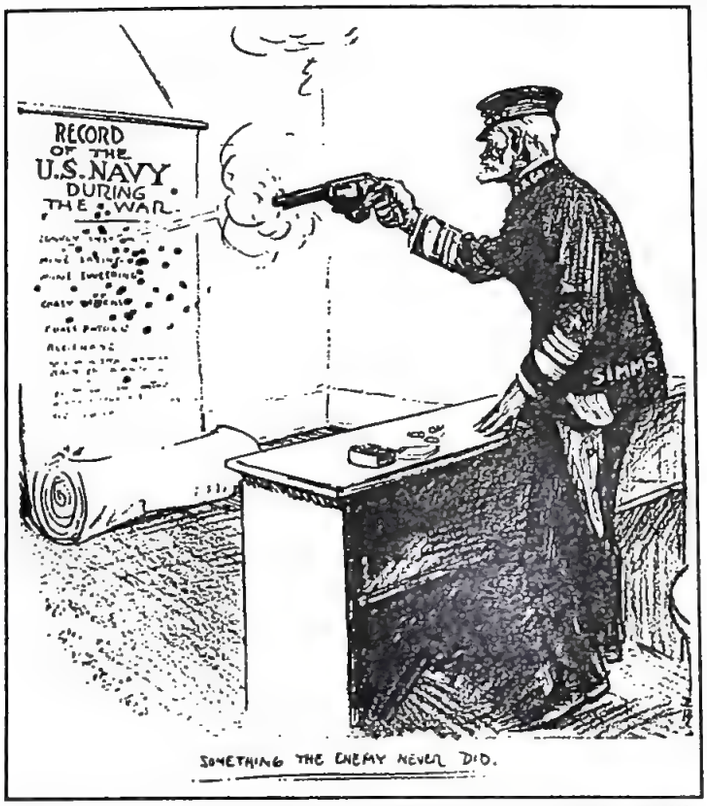
50. NIH, 2:2253-59.

51. Ibid., 2:2079.

52. Ibid., 2:2099-2100. For Sims's ideas, see ibid., 2:3407-08, and Paul Y. Hammond, *Organizing for Defense: The American Military Establishment in the Twentieth Century* (Princeton, NJ: Princeton University Press, 1961), pp. 71-76. Daniels's objections to a general staff are scattered throughout his testimony in NIH, vol. 2. See also Daniels, Diary, January 24, 26, 1915; Rear Admiral Bradley A. Fiske, USN, *From Midshipman to Rear-Admiral* (New York: The Century Company, 1919), pp. 546-59; Paolo E. Coletta, *Admiral Bradley A. Fiske and the American Navy* (Lawrence, KS: The Regents Press of Kansas, 1979), pp. 106, 114, 136, 139, 143, 148, and Chapter 13.

53. Dean C. Allard, "Admiral William S. Sims and United States Naval Policy in World War I," *The American Neptune* 35 (April, 1975): 97; Wheeler, *Pratt*, p. 111.

54. Mary Klachko, with David F. Trask, *Admiral William Shepherd*



A contemporary view of the controversy by cartoonist Rollin Kirby shows little sympathy for Sims's criticism of the Navy. From Josephus Daniels, *The Wilson Era* (Chapel Hill, NC: University of North Carolina Press, 1946), p. 346.

No English-speaking nation, said Daniels, had a naval officer directing naval policy or administration. He had sponsored the creation of the Office of CNO (in reality an amended version of legislation offered by his Aide for Operations, Rear Admiral Bradley A. Fiske) which would coordinate the work of the War College, General Board, and Office of Naval Intelligence. In June of 1915, the secretary had established an Advisory Council consisting of himself, his assistant, the CNO, and the bureau chiefs. During the Senate investigation,Chairman Hale had asked various officers to send him suggestions on reorganizing the Navy Department. In closing his statement, Daniels requested that Hale ask for comments from those who opposed as well as those who favored a general staff.[55]

In cross-examination, Hale asked whether the Navy had a war plan against Germany, particularly a "thoroughly prepared" antisubmarine plan for the Western Approaches.[56] Daniels replied that the Black Plan (also known as the Atlantic or German Plan) with its twenty-two subheadings, was specific enough, and that the General Board would, upon request, show all its plans to an executive session of the committee. This was done.[57] There was much "bunk" about war plans, Daniels averred; these must be progressive and be modified with changing conditions. Germany's Schlieffen Plan, for example, had exploded at the Marne, and Benson's assistant, Pratt, had written at least thirty modifying memoranda on the Black Plan. Although Daniels had acted on only six of the forty-five papers the General Board had sent him between 1914 and 1917, Benson argued that no formal written plan would have been followed because the U.S. Navy used plans the Allies had already used for three years. Hale retorted that by 1917 submarine warfare was an established fact and that plans could have been made to counter it.

Hale had an excellent point, for the great naval building program of 1916 centered upon capital ships (battleships and battle cruisers) rather than antisubmarine ships. Daniels responded volubly that he could not have risked war by acting overtly while the United States remained neutral. Moreover, because Congress was not in session between March 4 and April 5, 1917, he could offer it no recommendations. Further, no Allied nation had provided him plans for cooperation. On February 2, 1917, he had asked the General Board to submit a solution "as to methods of driving submarines from the sea."[58] The board's reply had been lost, most likely by someone in Benson's office.[59] At any rate, the board had recommended escorting ships to deep water from their ports and

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Benson: First Chief of Naval Operations (Annapolis, MD: Naval Institute Press, 1987), pp. 176-77.

55. NIH, 2:2285-2318. On May 5, Fiske wrote Sims that he had met with Hale and Senators Keyes and Ball, the two other Republican members of the committee, and prepared "the ammunition that Hale is to fire, and that [Rear Admiral William F.] Fullam is to fire." Sims Papers.

56. NIH, 2:2865, 2927.

57. Ibid., 2:2861-65, 2927. On January 18, 1915, Admiral Charles J. Badger, a member of the General Board, handed Daniels a letter in which the board said that "war plans are being constantly revised and kept up to date and are in such condition as to be immediately available for use by the Navy Department." GB Papers, No. 425.

58. NIH, 2:2887-89.

59. Ibid., 2:2919. On April 20, 1920, Fiske wrote that ". . . the Department went into the war without any plan for meeting the *actual* situation, that is the submarine situation, and that the second year after our entry into the war, I received a telegram from Benson asking me to suggest a reorganization of the Office of the Chief of Naval Operations!! Of course I know that the old Black Plan was a defensive one that nobody knew about or paid any attention to outside of the General Board, and I also know that it was lost. . . . You may be sure that I will bring this point strongly in the rebuttal." Sims Papers.

"arrang[ing] with British and French governments for convoy of our merchant ships through barred zones." Since Sims was a member of the board, he must have known about these recommendations. In addition, Daniels continued, on April 5, the day before Congress declared war, the board recommended that the Navy cooperate with the Allies and "if desired by the Allies, send immediately a number of destroyers to cooperate with the Allied powers in the barred zones." If the United States sent troops to Europe, the board saw the need of escorting transports from shore to shore.[60]

It was amply clear that the Navy had lacked an antisubmarine plan even at the end of the war, but Daniels never did give Hale a positive answer as to whether the Navy had a particular antisubmarine plan for Germany.

Hale also found it impossible to believe Daniels' assertion that "There was never a minute from April 6, 1917, to November 11, 1918, when a ship was ready to sail that the officers and men were not ready to man the ships, and this was true not only of fighting naval craft but also of hundreds of ships carrying troops and supplies, and merchant ships." Hale therefore asked Daniels to provide a list of all commissioned ships indicating the material and personnel preparedness of each on April 6, 1917. Using this table, Hale concluded that on February 2, 1917, 26 percent of the fleet was fit materially but that 74 percent of the ships needed an average of sixty days' repair time to make them fit. On April 6, sixty-three days later, the situation had improved somewhat, with 33 percent fit to fight and 67 percent still needing an average of sixty-seven days for repairs. As for personnel, "Only 10 percent of the vessels were fully manned and 98 percent of them averaged to be but 57 percent." Daniels objected strenuously and vociferously denounced Hale's eminently correct conclusions — to no avail.[61]

With Daniels' testimony over, Sims restated his case, and the hearings ended. Of the twelve admirals most responsible for directing the war effort, ten in addition to Sims had testified, and all had denied Sims's charges. In 1921, however, with Daniels out of office, a majority report signed by the three Republicans on the committee confirmed most of Sims's contentions, while two minority reports written by Democrats rejected them. By this time the hearings had all but been forgotten by the public.[62]

What had the 2.5 million words uttered at the hearings and the reports accomplished? Sims had not forced Daniels from the cabinet nor obtained a reformation of the Navy Department along the lines of a general staff. Indeed, no changes would occur until the early 1940s. Though Sims established that there was room for improvement in the department, he failed to prove that its shortcomings stemmed from poor administration. Instead, his critique revealed that, during the war, there had been differences of opinion between him and the leaders in Washington, more with Benson, who allocated resources, than with Daniels. From April to November 1917, especially in letters to Pratt, Sims had voiced his displeasure about the ships and manpower Benson allocated to him, the CNO's slowness in reaching decisions, the poor organization of his office, and his evident Anglophobia. By the end of 1917, however, he was greatly pleased with the way Benson had obtained cooperation from the Allies as a member of the Colonel E. M. House Mission that President Wilson sent to Europe.

In keeping with the traditional view instilled by the American system of civilian control, Sims had concentrated upon the military mission of winning the war. This "tunnel vision," and his management philosophy of maximum delegation of authority, led Sims to believe that "the man on the spot" should command. Instead, he was kept nominally subordinate to Admiral Mayo, and on occasion Washington sent him officers without orders and even directed ship operations without informing him. Sims was also distressed because Daniels vetoed his acceptance of an invitation to become a member of the British Admiralty and refused to allow his personnel to accept awards offered by Allied nations. As a statesman (or at least a politician), Daniels sought to further America's international political goals, including a new world order role for the United States.

These differences in outlook generated various questions. Could Sims hold Daniels responsible for the unpreparedness of the Navy to fight an antisubmarine war when, during at least the first half of the neutrality period, national policy did not call for preparedness and technology had outdated his plans? Could Daniels be faulted in his determination of the ratio of offensive and

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60. NIH, 2:2719.

61. Ibid., 2:2939-44, 3080-3138.

62. The appendix to NIH, vol. 2, contains suggestions for reorganizing the Navy from Assistant Secretary F. D. Roosevelt; the new CNO, Admiral R. E. Coontz; eight rear admirals; two captains; and one commander. Of these, nine recommended reorganizing the Department along the lines of a naval general staff. See also Kittredge, *Naval Lessons of the Great War*, pp. 346-60. In Roosevelt's copy of Kittredge's book, although at a later date than its acquisition, Roosevelt wrote that Kittredge presented a "brilliant partisan exposition" of Sims's case and that it was "one sided and utterly misleading." Hammond, *Organizing for Defense*, p. 82.

defensive forces when Germany still had a fleet-in-being, U-boats might harass the American coast, and millions of Americans were to be sent overseas? Was he wrong in supporting President Wilson's wartime and postwar objectives? (To put it another way, could he have kept his job if he had not?) Had Daniels been remiss in solving problems inevitably connected with coalition warfare? How much latitude should he have permitted Benson to exercise in preparing for war and directing fleet operations? Should the planning and strategic direction of wartime operations have been centralized in Washington or delegated to overseas commanders? The point is that these differences would have persisted regardless of the administrative organization of the department.[63] Further, Sims's critique had unexpectedly focused attention on the "reforms" Daniels had introduced into the Navy, such as providing schooling for enlisted men, allowing them to seek appointment to the Naval Academy, obtaining more chaplains, improving the naval penal system, and abolishing the officers' wine mess. The consensus was that such reforms were good, and that as secretary Daniels had, in his own words, performed "a great job greatly done."[64]

In conclusion, as this writer has said elsewhere:

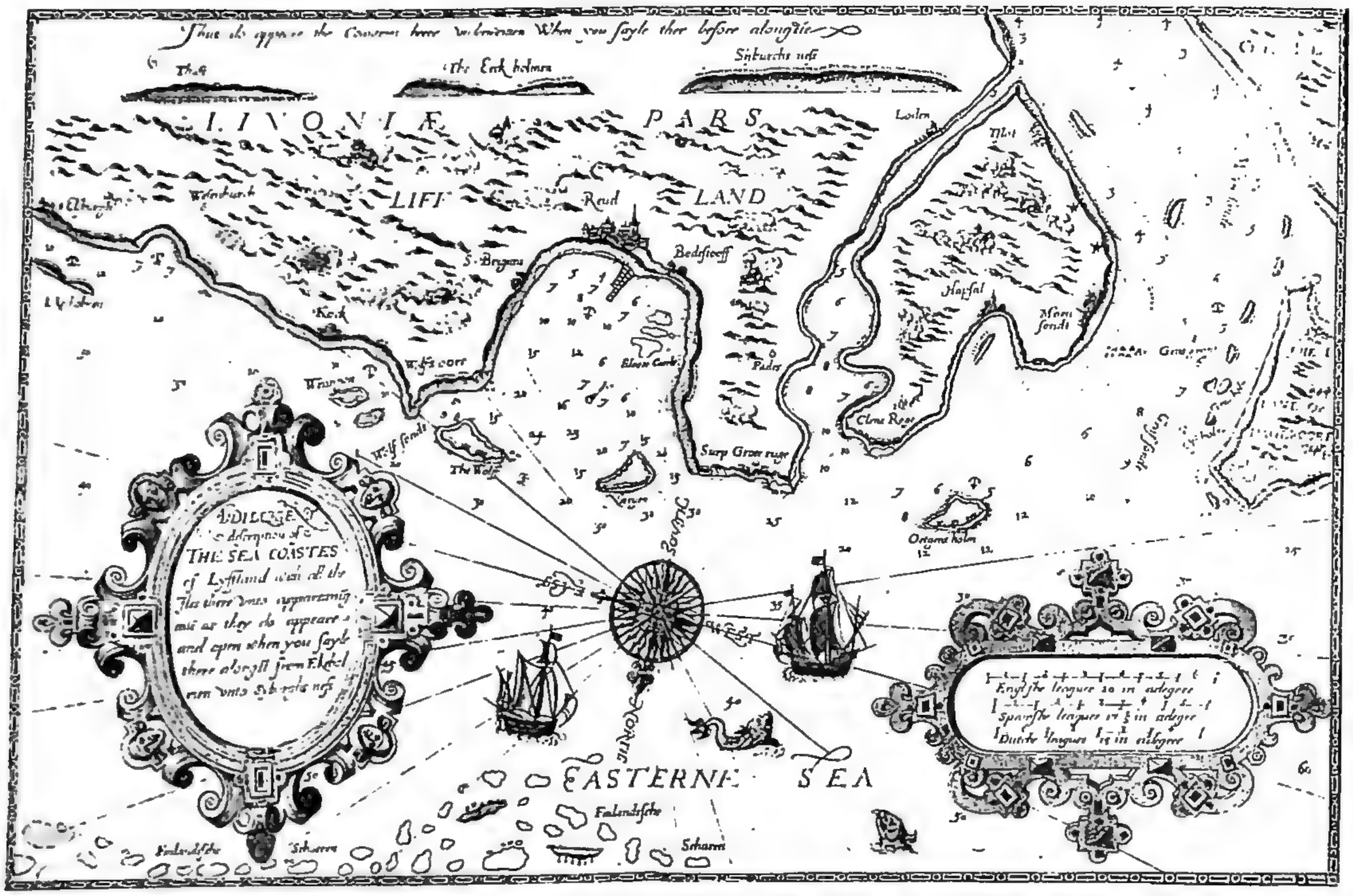
> The most important reason for the Navy's unreadiness for war was the administration's neutrality policy from 1914 to 1917, which forbade war preparations. Second, the system of appointing secretaries on the basis of politics has rarely if ever resulted in the choice of men capable of resolving technical disputes or of understanding naval traditions. Daniels, for one, correctly insisted upon civilian control of his department, but he preferred to democratize the Navy and deal with social matters rather than accept the recommendations on preparedness offered by Fiske, his chief military adviser from March 1913 to May 1915. Moreover, in choosing Benson as CNO he had a man largely untutored in strategy, who immersed himself in detail, did not institute a planning section in his office until the fall of 1918, and by putting American interests first was more concerned with the defense of the United States than cooperating with the Allies. A third reason was largely political — the administration's objective of obtaining naval parity with Great Britain. The result was that emphasis was placed upon building capital rather than antisubmarine ships. Fourth, the organization of the department was such that, until the war occurred, there was not full cooperation between the office of the secretary, office of the CNO, and the bureaus. There was also a lack of foresight in planning how to use the Navy in conjunction with the Allies, and the lessons of history with respect to the utility of convoy were overlooked. Lastly, the Navy could have done much more than it did to foster naval aviation, particularly to develop a viable torpedo plane, and to foster the technology required to destroy the U-boat.[65]

It is now clear that much of Admiral Sims's criticism of naval administration, both during the Great War and in general, was valid. At the time, however, he neither discredited Daniels nor reduced civilian control of the Navy. In fact, soon after the hearings he published, with Burton J. Kendrick, a Pulitzer prize winning book, *Victory at Sea*, that was completely sanitized of politics and criticism of the Navy Department. What his attack on Daniels had accomplished, however, was to raise questions that the Navy would address in future years and in future wars.

63. Morison, *Sims*, pp. 458-59.
64. NIH, 2:1983.

65. Paolo E. Coletta, *A Survey of U. S. Naval Affairs, 1865-1917* (Lanham, MD: University Press of America, 1987), p. 200.

A frequent contributor to The American Neptune, *Dr. Coletta is an emeritus professor of history at the United States Naval Academy at Annapolis. He has published biographies of Admirals Bradley A. Fiske, French Ensor Chadwick, Bowman Hendry McCalla, and Patrick N. L. Bellinger, and he is currently working on a biography of Admiral William A. Moffett.*



This chart of the coast of Estonia and the Bay of Tallinn by Lucas Janszoon Waghenaer and Anthony Ashley, ca. 1588, shows how features were sometimes drawn out of scale to reflect their importance to the navigator. From *The Mariners' Mirror*, 1588.

navigator to rely on what few indications remained to him: speed of the water rushing by, the orientation of his ship to the earth's magnetic field, and the relative position of observable celestial bodies. To make use of these cues, navigation required a symbolic representation of space reducing all the variables to three factors: location, distance, and direction. European mariners enjoyed access to direction with the development of the magnetic compass, in the Mediterranean from the thirteenth century[11] and in Northern Europe from at least 1483.[12] Distance measured in units more standard than the "day's sail" began to be expressed as minutes of arc of latitude with a chart drawn by Nicholas Germanus in 1466,[13] though it was not until publication of *The Seamans Practice* by Richard Norwood in 1637 that this value was established with accuracy.[14] Even with the standard of the "nautical mile" achieving widespread use, the league remained a popular though regionally variable unit of distance beyond the 1773 publication of *The Neptune Françoise* atlas.[15] Distance-measuring techniques such as the "Dutchman's log" (the transit of a floating object thrown overboard and timed between two points marked on the ship's rail) have seen constant use since antiquity,[16] but more standardized means such as the "common log" or "chip log" were in common use from the time of Richard Bourne's *A Regiment for the Sea*, published in 1574.[17]

With the ability to determine distance and direction, a navigator should theoretically be able to project his

11. Ibid., p. 115.

12. Ibid., p. 168, in reference to Pierre Garcie, *Le Grant Routier et Pilotage*.

13. Nathaniel Bowditch, *American Practical Navigator* (Washington, D.C.: U. S. Naval Hydrographic Office, 1963), p. 26.

14. Peter Kemp, *The Oxford Companion to Ships and the Sea* (London: Oxford University Press, 1976), p. 492.

15. Derek Howse and Michael Sanderson, *The Sea Chart* (New York: McGraw-Hill Book Company, 1973), p. 101. A Bellin chart from this publication gives different values for English, Breton, and French leagues.

16. See Harvey Oxenhorn, *Tuning the Rig* (New York: Harper and Row Publishers, 1990), p. 90, for use of the "Dutchman's log" in the barkentine *Regina Maris* while conducting oceanographic operations as late as 1983. The author can confirm this practice from his own experience in this vessel.

17. Kemp, *Oxford Companion*, p. 492.

position from a known point of departure, given an accurate record of the miles sailed on particular courses. This estimate is the basis of the "reckoning."[18] What the navigator cannot know, without the benefit of outside reference, is the effect on his position of the movement of the water through which his vessel is sailing, due to tide or current. The solution of "drift and set" involves relative motion and the application of vectors. It cannot be undertaken mathematically without completely adjusting one's perspective from the vessel to a hypothetical point above, exactly the perspective one assumes when consulting a chart. To effect this cognitive transformation, which was by no means necessary in piloting, requires the third symbolic variable: a system of location both for the surface of the earth and the celestial sphere, if celestial observations are to be used to establish position.

Our familiar system of location defined by latitude and longitude, with their corresponding celestial equivalents of Declination and Greenwich Hour Angle[19] (or right ascension), has been in use since the time of the Pythagoreans, and the relationship between astronomy and geography is equally ancient. In the third century B.C., the Greek mathematician Eratosthenes (276-195 B.C.) used observations of the sun to establish the circumference of the earth. By comparing the difference in noon time solar altitudes between Alexandria and Aswan on the same day of the year, and deriving from this the portion of the circle represented by their subtended angles, he obtained a factor by which to multiply the distance separating the two points. The astonishing accuracy of his calculation for the circumference of the earth (4 percent)[20] has endeared Eratosthenes to generations of geometry teachers, but he is seldom recognized for his invention of the "noon sight" that for centuries has been the primary method of establishing latitude by means of celestial observation.

There have traditionally been two techniques employed to determine latitude at sea: observation of Polaris and the noon sight. Because the earth maintains nearly constant axial stability as it revolves, and the diameter of its orbit around the sun is minuscule in comparison to the distance to even the closest stars, its axis of rotation remains pointed in the same direction for generations. During the past few centuries, the 1.6 magnitude star Polaris has occupied a position almost directly in alignment with the north axis.[21] An observation of Polaris's altitude, corrected for height of eye above the horizon, refraction, and the small orbit of the star due to its displacement from axial dead center, will yield a latitude equivalent to the corrected altitude. The tables of correction for height of eye and refraction were neither consistently accurate nor available until the eighteenth century. But the displacement corrections, which are more significant, were generally available in published ephemerides and were supplemented from the fifteenth to the seventeenth centuries by the use of nocturnals to measure approximate time.[22] A limitation of this method is that, as with any star observation taken with a horizon-oriented instrument, the measure of altitude can only be made when both star and horizon are visible; therefore, observations are restricted to the few minutes of twilight occurring at sunrise and sunset. Of more importance, the method cannot be used south of the equator where Polaris is obscured by the horizon.[23]

Compared to Polaris, the motion of the earth relative to the sun is more complex, compounded by the earth's revolution, tilt, orbit, and proximity. Once each day, however, at any given point on earth between the polar circles, the sun will appear to ascend to a maximum altitude and remain there for a few minutes before beginning its downward path toward sunset. At local meridian passage (local apparent noon), the altitude is dependent only upon the latitude of the observer and the date and approximate time of the observation. If the declination of the sun for every day of the year is known in advance (and such tables were commonly available in Europe from the mid-sixteenth century),[24] then comparison

18. Now more commonly called dead reckoning.

19. The actual position of the prime meridian has varied with time and nationalistic considerations. It was not formally established to be the Greenwich Meridian by international consent until 1884.

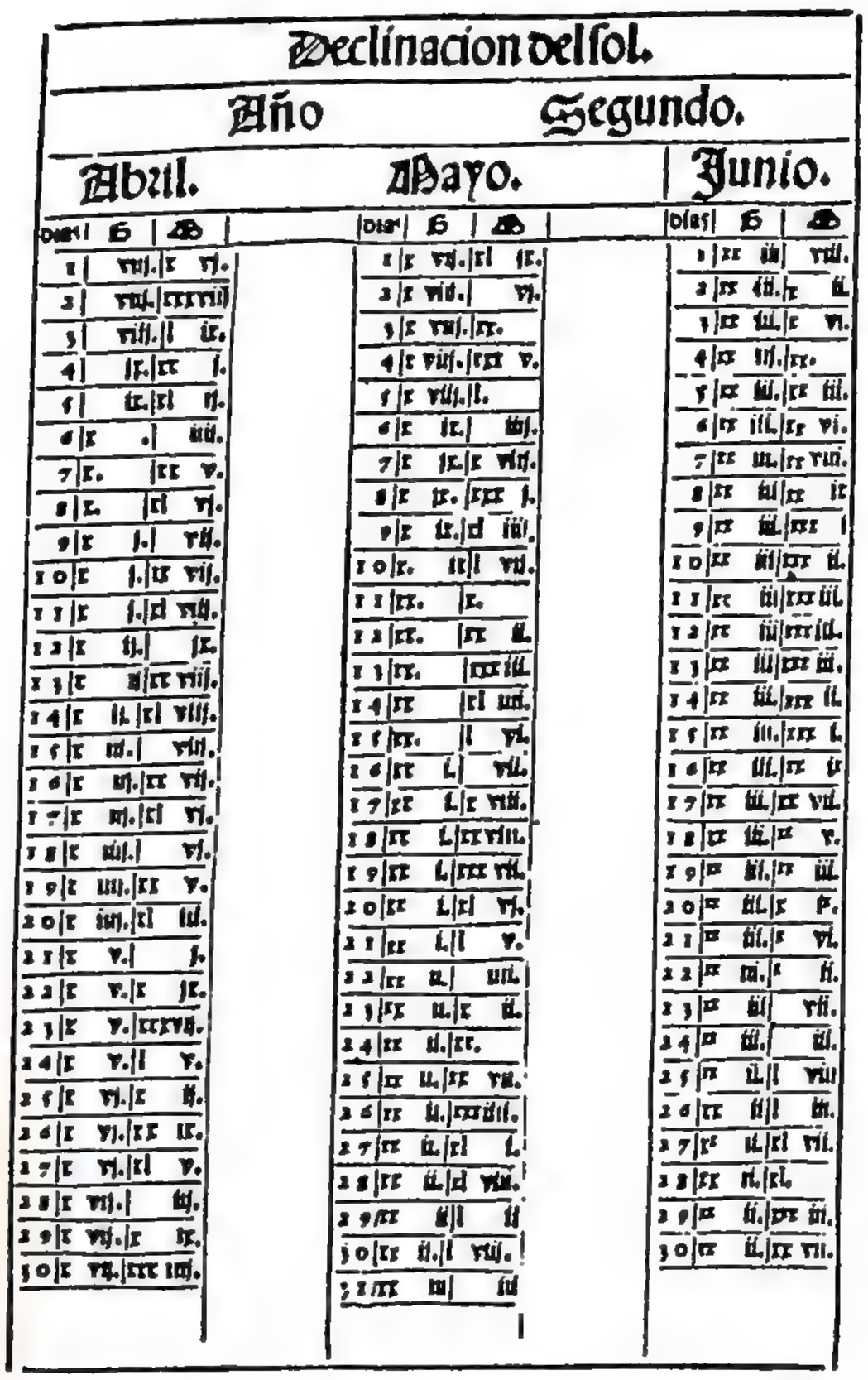
20. The accuracy is remarkable indeed considering that Eratosthenes used the day's journey of a camel as the primary unit of measure to determine the distance between the two locations. Subsequent recalculations by Marinus of Tyre and Ptolemy produced a value of distance for a degree of latitude 20 percent too low. This erroneous figure stood for thirteen centuries and, among other effects, encouraged Columbus to view the potential distance from Europe to Asia by a western route as unrealistically short. See Daniel J. Boorstin, *The Discoverers* (New York: Random House, 1983), p. 96, and J. H. Parry, *The Discovery of the Sea* (Berkeley, CA: University of California Press, 1974), p. 59.

21. This has not always been the case. In Homer's time, Kochab was closer to the celestial pole and Polaris was 12° off due to a 26,000 year cyclic wobble in the earth's axial orientation. See Taylor, *Haven-Finding Art*, p. 12.

22. E. G. R. Taylor and M. W. Richey, *The Geometrical Seaman* (London: The Institute of Navigation, 1962), pp. 61-63.

23. As a practical matter, south of 9° N. Lat., there would be too much refraction for accurate results.

24. Tables of declination were available to English mariners, for instance, from publication of Ashley's *Mariners' Mirror* in 1588, and to European mariners in general at least a century before, since such tables were used by Columbus on his voyages to establish latitude at noon.



Declinacion del sol.

Año Segundo.

Abril.		Mayo.		Junio.	
Dias	G	Dias	G	Dias	G
1	7 11	1	7 21	1	21 18
2	7 11	2	7 20	2	21 17
3	7 10	3	7 19	3	21 16
4	7 9	4	7 18	4	21 15
5	7 8	5	7 17	5	21 14
6	7 7	6	7 16	6	21 13
7	7 6	7	7 15	7	21 12
8	7 5	8	7 14	8	21 11
9	7 4	9	7 13	9	21 10
10	7 3	10	7 12	10	21 9
11	7 2	11	7 11	11	21 8
12	7 1	12	7 10	12	21 7
13	7 0	13	7 9	13	21 6
14	6 29	14	7 8	14	21 5
15	6 28	15	7 7	15	21 4
16	6 27	16	7 6	16	21 3
17	6 26	17	7 5	17	21 2
18	6 25	18	7 4	18	21 1
19	6 24	19	7 3	19	21 0
20	6 23	20	7 2	20	20 29
21	6 22	21	7 1	21	20 28
22	6 21	22	7 0	22	20 27
23	6 20	23	6 29	23	20 26
24	6 19	24	6 28	24	20 25
25	6 18	25	6 27	25	20 24
26	6 17	26	6 26	26	20 23
27	6 16	27	6 25	27	20 22
28	6 15	28	6 24	28	20 21
29	6 14	29	6 23	29	20 20
30	6 13	30	6 22	30	20 19
		31	6 21		

Declination table for "Abril—Mayo—Junio," second year after a leap year, 1545. Folio 1v (b) of Medina's *Arte de Navegar*, Valladolid, 1545.

of observed altitude with declination of the sun for that date by simple formula yields the latitude.[25]

Long before the eighteenth century, then, any navigator could employ simple methods to determine latitude when off soundings and out of sight of land. The accuracy of the results were dependent mostly upon the accuracy of the observation, with one minute of error corresponding to one nautical mile. Since the better instruments were capable of accuracy within fifteen minutes by the mid-sixteenth century, and improved to within two minutes by the middle of the eighteenth, mariners enjoyed a tolerable and improving level of accuracy throughout the period.

What they did not possess was a means to determine longitude. Because the earth's rotation imparts an apparent east to west motion to all celestial bodies at the rate of one every four minutes, the apparent position of any celestial body from a given point on the earth's surface is a function of time at observation, and unless time is known, it becomes impossible to utilize the body as a reference point except at local apparent noon. However, any event such as meridian passage, which occurs at the prime meridian at a specified time, will occur farther to the west at exactly the conversion factor of one degree equals four minutes.[26] Local time of an observation such as meridian passage, compared with the predicted time of the event at the prime meridian, yields longitude.[27] Excepting the possibility of a geomagnetic solution, the search for longitude boiled down to a search for accurate time.

Time had been measured by various means from antiquity, but to obtain accuracy sufficient for navigation there appeared to be only two prospects. The first was to build a clock that was portable enough to be carried to sea and would run at a steady rate despite the influences of constant and sometimes violent motion, changes in latitude (which affect the period of pendula), and variations in temperature and humidity. Timekeepers based on the earth's motion would generate cumulative error of up to one mile for every four seconds of time "out of rate."[28] The second possibility relied on the use of celestial motion

25. The actual formula used depends upon the relative position of the vessel and the sun. Only three circumstances are possible:

if Lat and Dec are same hemisphere, and Lat > Dec, then

Lat = (90° - Ho) + Dec;

if Lat and Dec are contrary hemispheres, then

Lat = (90° - Ho) - Dec;

if Lat and Dec are same hemisphere, and Dec > Lat (possible only in summer in the tropics), then

Lat = Dec - (90° - Ho),

where Ho = Sun's altitude, corrected for height of eye, refraction, and semidiameter. The time of day is of some importance, but since the sun's declination changes only very slowly (a maximum of 1 minute per hour and usually less) in its annual cycle, the factor of time at observation is not nearly as crucial to computations of latitude as to longitude.

26. In the case of stars, it is also necessary to allow for precession at the rate of 0.2 minutes every four minutes.

27. Because the sun hangs at the same altitude for a few minutes, the exact time of local apparent noon cannot be accurately established during the observation. By catching it sometime earlier, however, when the slope of its ascent is quite steep, and then catching it at the same altitude on the way down, the midpoint in time between these two observations, allowing for the vessel's motion in between, will yield time of local apparent noon for longitude with some accuracy. This equal altitudes method was the standard solution for longitude until the timed sight method was developed by Thomas Sumner in 1843 and improved by the assumed position method of Marc St. Hilaire in 1874. The latter remains the standard practice to date.

28. It is not necessary that the clock display time accurately, only that its rate of gain or loss remain perfectly constant so that accurate time may be derived.

operating independently of the earth's rotation, an "astronomical clock." Examples would include the orbit of the moon around the earth or the orbit of Jupiter's moons. To be useful, such motion needed to be observable under conditions prevailing at sea, and defined mathematically in relation to constants such as the position of the sun or certain background stars.

Another possibility, however, independent of a solution based on time, relied on position in the earth's magnetic field and the rough north and south alignment of "isogonic" lines of variation. Magnetic variation at any point during a voyage could be determined by use of an "azimuth compass" and bearings of the sun at dawn or sunset. These measurements, with luck, would place the ship in some accurate relation to her longitude.[29]

Each of these approaches to the solution of longitude had been proposed before the end of the sixteenth century. In 1530, Ranier Gemma-Frisius proposed the idea of the use of a good clock at sea to determine longitude in *De Principiis Astronomiae et Cosmographiae.*[30] The use of Jupiter's moons to derive longitude occurred to Galileo shortly after he discovered them in 1610, and in November of that year Claude Fabri de Peirsec calculated the periods and motions of the satellites in order to derive tables for this use.[31] A century earlier, Johanes Werner proposed that time, and hence longitude, could be determined by measurement of the angular distance between the moon and the sun or specific background stars,[32] elaborating on a proposal suggested by the German astronomer Regiomontanus in 1474.

Attempts at longitude by magnetic variation had been tried by Columbus, Magellan, and Abel Tasman. They were well enough known by Richard Bourne's day to merit his condemnation in *A Regiment for the Sea:* "No maister or pilot of a shippe doth keepe so simple account of the shippes way but that he may know what distance he hath unto any place better than he shall know by the varying of the compass."[33]

Criticism was hardly restricted to the magnetic variation method. The observation of Jupiter's moons required too much magnification to be practical at sea. Until the late eighteenth century, it seemed doubtful that technology was up to the task of producing sufficiently accurate clocks, and the tables defining the positions of moon and stars relative to time did not exist. Presuming they could be compiled, the mathematics would likely be tedious, and the level of accuracy required was beyond the capability of navigational instruments until the 1730s. In *The Seamans Secrets,* published by John Davis in 1595, the author advises:

> Now there be some that are very inquisitive to have a way to get the longitude, but that is too tedious for seamen since it requireth the deep knowledge of astronomy, wherefore I would not have any man think that the longitude is to be found at sea by any instrument, so let no seamen trouble themselves with any such rule, but let them keep a perfect account and reckoning of the way of their ship.[34]

This left the mariner with a fairly accurate means of calculating latitude and the substantial skills inherited from a long tradition of dead reckoning. These ingredients were the basis of latitude sailing, the prevalent and most conservative procedure used throughout the period of oceanic navigation under sail. After departure, the navigator kept reckoning of longitude to the best of his ability while making for the latitude of his destination as far as wind and other considerations allowed. Arriving at the proper latitude some distance east or west of the destination, the final run was made "down the latitude," holding this value constant by means of noon or Polaris sights.

Intrinsic to the successful application of this strategy is the fundamental element of "intentional error." It is axiomatic that a sailing vessel in open water should almost *never* sail in the exact direction of her destination, but toward a point some distance to windward of it. The additional ground to weather serves not only as a safety cushion to protect the vessel from running on to a lee shore or hazard, but also renders automatic the decision of which way to turn upon reaching an appropriate line of position before landfall. By introducing intentional error, the mariner ensures that the final course to destination will be downwind along a line of latitude, or along a line of latitude to a point on the coastline to windward of the objective, and then down the coast to destination. The amount of error induced will depend upon a number of variables such as the length of the deepwater voyage,

29. From the sixteenth to the eighteenth centuries, various individuals surfaced to public attention, claiming to have discovered the secret to the longitude. Most of these schemes seem to have been based on magnetic variation, and the constant allusions to mystical solutions based only on rehashing well-known phenomena may have contributed to the cynical reputation of longitude as a refuge for crackpots.

30. Eric G. Forbes, *Greenwich Observatory, Vol. I: Origins and Early History (1675-1835)* (London: Taylor and Francis, Ltd., 1975), p. 12.

31. Ibid., p. 4.

32. Alan Stimpson, "Navigation," in *The Visual Encyclopaedia of Nautical Terms Under Sail,* George Naish, et al., eds., (New York: Crown Publishers, Inc., 1978), p. 15.

33. Quoted in Taylor, *Haven-Finding Art,* p. 202.

34. Quoted in Bowditch, *American Practical Navigator,* p. 44.

the direction of the wind on approach, the presence of dangers, the size of the target, and the weatherliness of the vessel, many of these the normal considerations of piloting. There might also be military implications involved, since a predatory vessel could linger near the latitude of the destination and/or to windward of it to pick up inbound traffic.[35] Even in modern practice when longitude can be determined, intentional error is customarily applied as a safety consideration, but in former use it was crucial to the safe prosecution of a voyage by latitude sailing. Failure to apply sufficient intentional error sometimes resulted in tragic consequences, and these in turn could easily be blamed on the state of the science, "not knowing the longitude," rather than operational mistake. In fact, the urgency to discover the longitude is often attributed to two sensational examples which, at the time they occurred, focused much attention on the problem: the last voyage of Sir Clowdisley Shovell, and the circumnavigation of Lord Anson in 1740-44.

The Mediterranean fleet under Shovell's command was returning home in October, 1707, making an approach to the English Channel in thick weather, when seven out of twelve ships-of-the-line, including the flagship HMS *Association* (90), fetched up on the Bishop and Clerk rocks off the Scilly Isles. Five of the ships broke up, and two thousand lives were lost, including Shovell's. Despite obvious indications that the fleet was well west of reckoning, it was the effect of an unsuspected *northerly* current, combined with an inability to substantiate latitude through celestial observation due to the weather, that brought the fleet to disaster.[36] In addition, the inquiry after the tragedy determined that courses ordered had not been steered due to fault with the wooden compass bowls then common.[37] Given the circumstances, it is difficult to see how Shovell's approach to the channel might have benefited from access to accurate time, when even existing means of finding latitude and steering an accurate course for reckoning were not able to be utilized.

Anson's case involved a combination of circumstances, some of them external to navigation. Hindered by a generally poor state of health among his crews from the outset and a lengthy and difficult passage around the Horn, Anson's ships began to suffer loss from scurvy even before winning through to the Pacific. On April 14, 1741, when standing north into what they thought should be empty ocean, the squadron sighted Cape Noire right ahead. This was discouraging to say the least, as it appeared from this prospect that two hundred leagues of westing they had supposedly won since the Horn had been eaten up by an easterly current and by delays incurred while damaged ships made repairs to rigging. After standing southwestward for several days to get sea room, the squadron again turned north. Under the pressure of men going down with scurvy daily, Anson decided on the advice of Justinian Nutt, master of the *Centurion*, to stand directly for Juan Fernandez without allowance for intentional westward error so as to shorten the passage. On arrival at the latitude of Juan Fernandez, Anson correctly surmised his position to be to the east of the island, but he was not completely certain. After beating to the westward for a few days, and apparently coming to within a few hours of the island, Nutt advised that *Centurion* turn eastward.[38] She ran all the way down to the coast of Chile to make her landfall and then had to work to windward back to Juan Fernandez, exactly the circumstance intentional error is employed to prevent. The additional time consumed two weeks and nearly one hundred lives. By the time the *Centurion* came to anchor, there were thirty men out of an original crew of 521 able to assist in working the ship.[39] Other ships in the squadron arrived later and fared worse.

This horrifying episode inspired much commentary, from Coleridge's "Ancient Mariner," to David Landes's only slightly less graphic version of the problem:

> An error of longitude could mean a missed landfall; days, even weeks, of wandering in emptiness; crews lost to disease and thirst. Once the able-bodied complement fell below the minimum, the survivors could no longer even bring the ship about and were at the mercy of wave and sky.[40]

35. The Manila Galleons *Santa Anna* and *Nostra Señora de la Incarnación Disenganio* fell into the hands, respectively, of Cavendish in 1587 and Woodes Rogers in 1709, while the English at both times tarried in the vicinity of Cabo San Lucas hoping for such an eventuality. The galleons were bound for Acapulco and were making their landfall to windward, at the Cape. Anson also worked the same area in March and April of 1742 without success. See Roger Morris, *Pacific Sail* (Camden, ME: International Marine Publishing, 1987), p. 47, and Leo Heaps, *Log of the* Centurion (New York: The Macmillan Company, Inc., 1973), pp. 147-163. These are only a few examples of what must have been common procedure.

36. Kemp, *Oxford Companion*, p. 799.

37. G. J. Marcus, *Heart of Oak* (London: Oxford University Press, 1975), p. 50.

38. Ironically, this decision may ultimately have saved the ship. A powerful Spanish squadron lay waiting in Juan Fernandez for Anson's arrival. The commander had orders to put every Englishman to the sword, but tired of waiting and departed before the *Centurion* showed up. Obviously, the English would have been in no condition to resist. Heaps, *Log of the* Centurion, p. 100.

39. In Anson's voyage, 1,057 out of 1,939 men of the squadron died, most of them from scurvy. Four men died from enemy action. Christopher Lloyd, "Cook and Scurvy," *Mariner's Mirror* 65, no. 1 (February 1979): 23.

40. Landes, *Revolution in Time*, p. 108.

Given that Anson's problem may not have been entirely the inability to find longitude, but also the consequence of failure to pursue a conservative strategy in exchange for a gamble on saving time, the tragic loss nonetheless inspired greater efforts to apply the powers of science and the state to solve Anson's two scourges: scurvy and uncertainty of longitude. They have remained linked in perception ever since, both traditionally assumed put to rest forever by the voyages of James Cook.[41]

By Anson's day, European states had been actively involved with longitude for some time. Preceding English interest, Phillip III of Spain offered a substantial award for the solution to longitude upon his accession in 1598. Following suit, the governments of Holland, Venice, and France offered large awards, as did several private donors.[42] But the most famous prize, and the center of much controversy, was that of £20,000 to be administered by the English Board of Longitude at its creation by act of Parliament on 11 June 1714. The English government had expressed a commitment to the solution of the problem long before this, however, in establishing the Royal Observatory at Greenwich and the position of Astronomer Royal in 1675. In the first such appointment, John Flamsteed was directed:

> . . . forthwith to apply himself with the upmost care and diligence to the rectifying the tables of the Motions of the heavens and the places of the fixed stars so as to find out the so-much-desired Longitude of Places for the perfecting the Art of Navigation.[43]

It is not surprising that the state should wish to involve itself in such endeavors, quite independent of whatever benefits might accrue to mariners. The discovery of longitude was inextricably linked to time, and the structure of time has always been the prerogative of the state. Evidence of this lies in the monumental architecture of ancient civilizations and the alignment of these massive structures with azimuth at sunrise on days of equinox and solstice, establishing the calendar. Possibly the best eighteenth-century example of a state's interest in the structure of time was the imposition of the revolutionary calendar in France by the Committee of Public Safety in 1793.[44]

In addition to time, the eighteenth-century state was vitally concerned with the precise definition of location as a means of substantiating the legitimacy of claims over territory, including that newly discovered. Byron, Wallis, Bouganville, and Cook were specifically enjoined in their sailing orders to utilize whatever means necessary to establish the correct latitude and longitude of discoveries, and to look in the reported locations of those of rival states to ascertain the validity of their claims. The latent mission of Cook's first voyage, and the specific object of his second, was to discover and define by position the existence of the great southern continent, *Terra Australis Incognita*, which prevailing theory held necessary to balance the land mass of the northern hemisphere. Had such territory existed, the potential for exploitation could have been profound. Every effort was made to ensure that positions were accurate by the most advanced technical means available; Wallis and Cook (on his first voyage) sailed with Meyer's tables for longitude; Cook (on his second and third voyage), Vancouver, and even Bligh[45] sailed with chronometers after such instruments became obtainable.

The correct position of geographic features, particularly on charts, is of vital importance to the mariner as well as the state. Naturally, so is his own position, and it is to this overt concern that the search was addressed. Positional astronomy clearly favored a solution based on

41. The search for a cure for scurvy is another example of the mainstream incorporation of scientific advances into everyday practice. In the year after Cook's death there were 2,400 cases of scurvy in the Channel fleet from a ten-week cruise in the Bay of Biscay. In the West Indies at this time, where fresh fruit was readily available, there were twice the number of cases of scurvy than of any other disease including fevers. James Lind had published *Treatise of the Scurvy* in 1753, after conducting a series of controlled experiments, and concluded correctly that concentrate of orange or lemon juice would prevent the disease. Lloyd, "Cook and Scurvy," p. 23. The British Admiralty did not order a regular issue of lemon juice concentrate until 1795, and not until then was scurvy really eliminated. In faimess, it took some time to establish which parts of Cook's program were responsible for his success (lime juice, for instance, is of little value, contrary to tradition) and to develop a means to distill concentrate from citrus without destroying its beneficial qualities. Parry, *Trade and Dominion*, pp. 218-219.

42. Lieutenant Commander Rupert Gould, *The Marine Chronometer: Its History and Development* (London: The Holland Press, 1923), pp. 12-13.

43. Originally from Royal Warrant of 4 March 1674/75, quoted in its entirety in Forbes, *Greenwich Observatory*, 1: 19-20.

44. To give a second example, in order to account for accumulated error by centuries of English adherence to Julian dating, in 1752 the Julian Calendar was supplanted by the Gregorian, substituting the 14th of September for the 2nd. Much public outrage was expressed towards James Bradley, the Royal Astronomer at the time, by people who seem fervently to have believed that he had robbed them of two weeks of their lives. His sudden death on 13 July 1762 was held to be divine retribution. Forbes, *Greenwich Observatory*, 1: 117-118.

45. Given his background and reputation, Bligh might have been expected to discover something. Bligh was lent the Kendall device K2 after this instrument had been taken on Captain Phipp's North Polar expedition (in which 14-year-old midshipman Horatio Nelson sailed aboard HMS *Carcass*). The *Bounty* mutineers kept the chronometer after disposing of Bligh. It was given by John Adams to Captain Mathew Folger of the American sealing ship *Topaz* in 1808 and after yet further adventures now rests in the National Maritime Museum. Gould, *The Marine Chronometer*, pp. 73-74.

the astronomical clock, but little concrete progress had been made between 1675 and 1714 when the eccentric theologian and mathematics teacher William Whiston approached the Royal Society with a plan to establish floating lightships arranged at fixed points across the Atlantic. At intervals, these ships would fire star shells manufactured to explode at a height of 6,440 feet, affording ships the opportunity to determine distance from the nearest lightship by timing the interval between the flash and the report.[46] The Royal Society, whose members included Isaac Newton and Edmund Halley, did not deign to give Whiston's proposal strong consideration, but they did recommend establishing an award for a solution, providing the incentive for private enterprise to enter the search for longitude. Inadvertently, they also started what would become a bitter and symbolic contest between the efforts of craftsmen and those of state-supported scientists.

Until 1737, the Board of Longitude entertained no serious applicants for the award.[47] Most petitions involved concepts based upon a geomagnetic solution, which, for lack of progress in the celestial approach, had never really died. In 1673, Henry Bond had claimed to have established tables to derive longitude from variation and the dipping of the magnetized needle.[48] Edmund Halley had similar hopes from his production of the first isogonic variation chart,[49] and the irrepressible William Whiston resurfaced again to submit a claim to the Board of Longitude after his 1721 publication of *The Longitude and Latitude found by the Inclinatory or Dipping Needle*. On his first voyage, Cook was issued a dipping needle to attempt the correlation of longitude by this method with results from lunar distance. All of these efforts came to naught. Lines of constant variation in the earth's magnetic field do not remain stable over time, they are not at all symmetrical, there are many local anomalies, and they are generic over areas too large to be useful for longitude. These problems were fairly well appreciated even before the eighteenth century.

On the other hand, almost four decades after the establishment of the Board of Longitude, the glacial efforts of positional astronomy were finally closing in on a solution. By 1752, the German astronomer Tobias Meyer, utilizing thousands of observations of the moon taken by Flamsteed, Halley, Pierre-Charles Lemonnier, Jacques Cassini, and others, derived a set of tables predicting the moon's position relative to the sun and particular background stars expressed as the angular distance separating them, yielding standard time at observation. Measurement of the altitudes of these bodies simultaneously could determine local time, and the difference between local and standard time yielded longitude. Sea trials of this method performed by John Campbell in *Essex* (70) in 1757, and *Royal George* (100) in 1758-9 proved inconclusive, but in a 1761 voyage to St. Helena to observe the transit of Venus, and then again in 1763 in a voyage to Barbados, the astronomer Nevil Maskelyne used Meyer's tables to obtain positions within 1° of true longitude at landfall.[50] Between the two voyages, Maskelyne published *The British Mariners Guide* explaining the technique. He was appointed Royal Astronomer in 1765, and from 1766 began yearly publication of the *Nautical Almanac*, providing simplified formulae for the calculation of position by observations of lunar distance. It was Maskelyne's technique which Wallis occasionally used in his circumnavigation of 1766-68 and which Cook employed on his first voyage, leading Cook to assert:

> It is only by such means that this method of finding Longitude at sea can be put into universal practice — a method that we have generally found may be depended upon to within half a degree; which is a degree of accuracy more than Sufficient for all

46. As ludicrous as this scheme sounds within the context of its own era, it closely resembles the basis for the geosynchronous satellite system (or GPS), the current state of the art in electronic navigation. In his own time, Whiston's ideas won him much ridicule. Plate VIII of Hogarth's *A Rake's Progress* depicts a scene in Bedlam containing a lunatic diligently working away on a scheme for longitude based on Whiston's proposal.

47. Throughout its history, the Board did entertain several frivolous ones. For example, passages preserved at the Royal Observatory from proceedings by the Board include these:

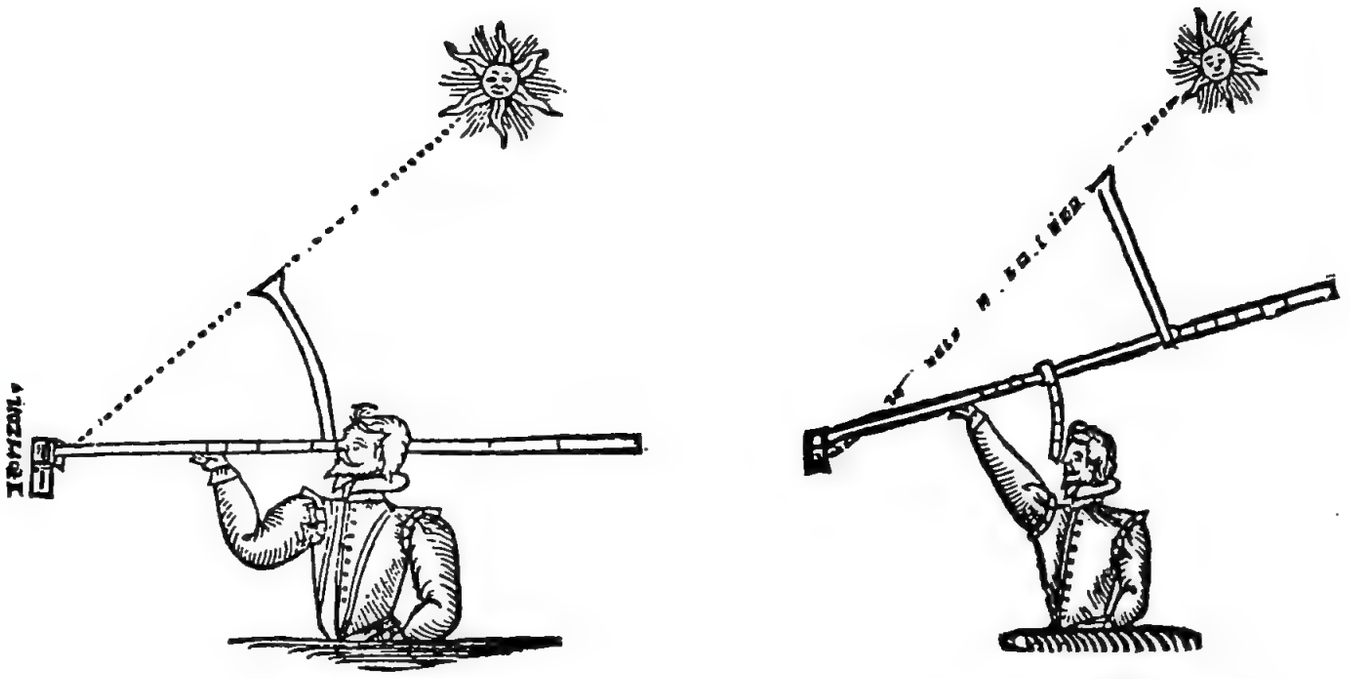
"Jan. 25, 1772. A person who calls himself John Babtist desiring to speak with the Board, he was called in and showed them some schemes and drawings of figures which he desired they would enable him to publish: He was informed it was not in their power. . . . He was then desired to withdraw."

"June 13, 1772. A Memorial from Mr. Owen Straton was read, proposing a method of finding out the longitude by means of an Instrument of his invention, and the said Mr. Straton, who was attending, being called in, and it appearing that the instrument proposed is a Sun Dial, he was told it could not be of any service, and then withdrew." Rupert Gould, "John Harrison and His Timekeepers," *Mariner's Mirror* 21, no. 2 (April 1935). Annual lecture for 1935.

48. E. G. R. Taylor, "Old Henry Bond and the Longitude," *Mariner's Mirror* 25, no. 2 (April 1939).

49. Gould, *The Marine Chronometer*, p. 4.

50. From the late seventeenth century, pendular "astronomer's clocks" based on time derived from observation of Jupiter's moons, though unsuitable for service at sea, could be used on land to establish correct longitude. Hence Maskelyne's ability to confirm the accuracy of his technique upon arrival. Maskelyne was not the first to use the lunar distance technique effectively. Lacaille made a voyage to the Cape of Good Hope in 1759-60 using Meyer's tables, obtaining a level of accuracy within 1°.



Captain John Davis's *The Seamans Secrets,* 1595, pictured the 45° (left) and 90° (right) Davis, or English, back staffs. While a great improvement over the fourteenth-century cross staff, the back staff was in its turn made obsolete by the introduction of Hadley's quadrant in 1731.

> Nautical purposes. Would Sea officers once apply themselves to the making and calculating these observations they would not find them so very difficult as they at first imagine.[51]

Lunar observations had become practical by this time only through a dramatic improvement in optical instruments. The Davis back staff [52] had been in widespread use since 1594, but was generally accurate only to within fifteen minutes.[53] Since an error of one minute measured arc in lunar distance might produce a corresponding error of thirty minutes longitude, the resulting potential error in position of as much as 450 miles clearly rendered lunars inaccessible with old technology. But with the introduction of Hadley's quadrant in 1731, and its commercial availability from 1734, accuracy to within two minutes brought lunars into the range of practicality. John Campbell's introduction of the sextant in 1757 provided a means to measure the larger angles that lunar distance observations sometimes required. Greatly improved accuracy in latitude observations came as an additional bonus.

Lunar distance observations presented problems. Even with accuracy to two minutes, the corresponding potential error of one degree of longitude is hardly trivial.[54] Availability is also a problem, with only about twenty days of access per lunation. The greatest stumbling block, however, lay in the complexity of the calculations, which were hardly as simple as Cook was letting on. Because of the moon's closeness, its apparent diameter, and the compounding of its motion with that of the sun and stars, there are a number of corrections required to "clear" the observation of these factors, corrections that are far more involved than with an ordinary measurement of altitude. Considering that several observations need to be taken and averaged to approach desired accuracy, the entire process

51. J. C. Beaglehole, *The Journals of Captain James Cook, Vol. 1, Voyage of the Endeavor, 1768-1771* (London: Cambridge University Press for the Hakluyt Society, 1955), p. 392.

52. This device had been a great improvement over the cross staff, in use since 1342. H. O. Hill, *Instruments of Navigation* (London: Her Majesty's Stationary Office, 1958), p. 8.

53. Parry, *Trade and Dominion,* p. 221.

54. Despite Cook's recommendation, in later comparisons at sea of lunar distance positions against those derived from chronometer, the two were often 1° or more apart. Upon making landfall, the chronometer usually proved to be right.

might take four or five hours to work through. How many masters might be capable or willing to go to these extremes was problematic, but even so, it appeared that organized science had finally triumphed and found the longitude. The only cloud on glory's horizon was a self-taught Yorkshire watchmaker named John Harrison.

Harrison's well-known struggle to obtain recognition and full remuneration from the Board of Longitude is often cited as the classic case of the lone inventor fighting for justice against the perfidious establishment. The prospect of building a timekeeping machine with a rate of going constant enough to derive longitude had occupied European clockmakers for centuries, but the problems involved with the use of such devices at sea were formidable, and before Harrison's time, deemed insurmountable. Christiaan Huygens, working in the service of Louis XIV, had probably come the closest to a solution, first with his invention of the pendulum movement in 1657, and then with the balance spring in 1674. In a letter of March 1673 to his patron sovereign advocating his work, he advised:

> Further you are not unaware of the more specialized uses which I intended for them [his clocks] from the beginning. For example they are especially well suited for celestial observations and for measuring the longitudes of various locations by navigators. By your order, more than once our clocks have been transported by sea.[55]

Despite Huygens' assertion, pendulum clocks could not be made to operate at sea because of motion and variation of period with latitude, though they could be taken ashore and started up to establish the longitude "of various locations." His balance spring mechanisms also suffered the problems of friction, motion, and dissimilar rates of expansion of various parts due to temperature, so that his work never attained the consistency of rate demanded.[56] Neither did anyone else's until 1737.

In that year, following encouraging tests of a machine carried to Lisbon in HMS *Centurion* and returning in HMS *Orford*, the official minutes of the Board of Longitude for June 30 reveal:

> Mr John Harrison produced a new invented machine, in the nature of clockwork, whereby he proposes to keep time at sea with more exactness than by any other instrument or method hitherto contrived . . . .[57]

This machine, H1, weighed 72 pounds, exclusive of its heavy gimballed container, and was deemed promising but in need of extensive development. Harrison was voted £500 to continue research, and he produced the near replica H2 in 1739. Neither H2 or its equally large successor H3, which Harrison did not complete until 1757, ever made it to sea. Instead, the small pocket watch-style machine H4, originally conceived as a companion device to H3, entered the great contest for longitude in 1761 with its voyage to Jamaica with Harrison's son in HMS *Deptford*. The performance of the device throughout the voyage astonished the officers of this ship, and at landfall, the chronometer proved to be only 5.1 seconds slow, corresponding to an error of less than 1.25 miles. The Board of Longitude, with its hopes pinned on the lunar distance method, remained unconvinced pending further proof, and relations between Harrison and the board became strained.

In 1764, H4 went out to Barbados in HMS *Tartar* and home with Nevil Maskelyne, the arch proponent of lunar distance, in attendance as official observer. H4 performed in exemplary fashion, its rate accurate to .1 seconds per day, and had accumulated an error at the end of the voyage equivalent to 9.8 miles, while Maskelyne was out by a full degree. No one could doubt the validity of Harrison's claim, but the award was nonetheless tendered in installments, each the product of further stipulations. Harrison was required to submit the devices, to give further explanations, and to provide proof of accuracy and reproducibility. The squabbles whipped up sensational attention and were not concluded until the intervention of George III in Harrison's behalf. "Longitude" Harrison did not receive the final payment of £10,000 until 1773, when he was eighty years old.

Harrison's case was no doubt complicated by his remarkable inability to articulate the secrets of H4's manufacture, not to mention his suspicion that by doing so he might remove the incentive for granting the remainder of the prize. But reproducibility was a valid concern. The *Nautical Almanac*, with tables for lunar distance, could be printed inexpensively in mass. It was not too much to hope, given the potential of England's substantial clockmaking industry, that chronometers might come to be

55. Christiaan Huygens, *The Pendulum Clock, or Geometrical Demonstrations Concerning the Motion of Pendula as Applied to Clocks*, trans. Richard Blackwell (Ames, IA: The Iowa State University Press, 1986), p. 8.

56. Huygens' work had reduced the clock's potential standard of error in rate from fifteen minutes per day to ten seconds. Samuel Macy, *Clocks and the Cosmos* (Hamden, CT: Archon Books, 1980), p. 41. Since errors of rate are cumulative, this standard could generate an error in position of as much as 75 miles by the end of a one-month voyage.

57. Gould, *The Marine Chronometer*, p. 47.

as available as Hadley's quadrants.[58]

Given the promise offered by the chronometer, there is a singular lack of urgency to the convoluted proceedings of Harrison's case, and even more so to the delay of twenty-four years between the time H1 attracted the interest of the Board of Longitude and the time H4 embarked for its first test at sea. The leisurely pace at which the device was allowed to develop is hardly consistent with the notion of ships, lives, and valuable cargoes frequently coming to grief for the want of it. Apparently, the interests of exploration and survey were a different matter. When Cook sailed on his second voyage in 1772, to discover or dispel *Terra Australis Incognita* once and for all, four of the eleven chronometers then in existence sailed with him.[59]

Having recommended longitude by lunar distance so highly, Cook was initially skeptical of the chronometer. By November of 1772, when *Resolution* and *Adventure* reached the Cape of Good Hope, the two Arnold chronometers were already losing time. When Cook referred to the devices at this point in the voyage, there was no hint of the affection that would later characterize his remarks,[60] but on 9 January 1773, he wrote: "Indeed our error can never be so great so long as we have so good a guide as Mr Kendalls watch."[61] By November 1774, Cook was using the chronometer and celestial observations ashore to correct the positions of Cape Palliser and Queen Charlotte Sound, New Zealand — positions which he had previously established by means of lunar distance. He stated that:

> Even the situation of such islands as we past without touching are by means of Mr Kendalls Watch determined with almost equal accuracy.[62]

At the end of the voyage, on 29 July 1775, *Resolution* and *Adventure:*

> . . . made the land about Plymouth, Maker Church, at 5 o'clock in the afternoon, bore 10° west distant 7 Leagues, this bearing and distance shew that the error of Mr Kendalls Watch in Longitude was only 7' 45" [at that latitude about five miles], which was too far to the west.[63]

The outstanding performance of Kendall's chronometer during the epic three-year voyage easily merited Cook's subsequent description of it as "our faithful guide through all vicissitudes of climates,"[64] and the judgment of history that the longitude had at last been found. But the issue of significance still remained. The search for longitude had been carried out on a level far removed from that of the ordinary mariner, who stood much to gain from a simple, dependable, and inexpensive method to determine his position. Unfortunately, this particular combination of attributes remained as elusive as ever.

The tables for lunar distance were carried in various nautical almanacs until the 1920s, but there is considerable question as to the universality of their application. In the Royal Navy, where midshipmen trained under the ship's master and schoolmasters were carried aboard the larger ships on an institutional basis from the mid-eighteenth century,[65] there seems to have been no program to implement instruction in the technique of lunar distance until well into the 1820s. In the merchant service, formal instruction was on an even more haphazard basis. In 1780, sales for the British nautical almanac, which carried much useful information in addition to lunar distance tables and might also have been puchased for other navigational applications, ran to 800 copies.[66] For the 1790 edition, the run had only been increased to 2,000.[67] Some of this production was no doubt absorbed by the navy,

58. The British production of watches in 1798 has been calculated at 50,000 per year for the home market. By the early nineteenth century, this figure had increased to 120,000, the industry employing 20,000 persons. Macy, *Clocks and the Cosmos*, p. 35. This industry was so prominent that Adam Smith used it as his most powerful example for the decrease in unit cost as a result of efficiency in mass production. Adam Smith, *An Inquiry into the Nature and Causes of The Wealth of Nations*, vol. 1, reprinted from the sixth edition (London: G. Bell and Sons, Ltd., 1925), pp. 256-257. France enjoyed no similar potential. The revocation of the Edict of Nantes by Louis XIV in 1685 caused a mass exodus of *reformes*, among whom were most of the nation's clockmakers. England and Switzerland were the chief beneficiaries of this immigration. Landes, *Revolution in Time*, pp. 92-93.

59. H1, 2, 3, and 5 were in government possession at the Royal Observatory. H4 was also there, having been dismantled and reassembled to rate. Cook sailed with a copy of H4 by Larcum Kendall which proved superb, and three of John Arnold's, two of which were disappointments. The French had also become interested, and Pierre Le Roy produced a chronometer in 1766 and another the following year.

60. J. C. Beaglehole, *The Life of Captain James Cook* (Palo Alto, CA: Stanford University Press, 1974), pp. 308-309.

61. Ibid., p. 364.

62. Captain James Cook, *The Explorations of Captain James Cook in the Pacific as Told by Selections of his Own Journals (1768-1779)*, ed. A. Grenfell Price (New York: Dover Publications, Inc., 1971), p. 179.

63. Ibid., p. 190.

64. From letter of Cook to Stephens, 22 March, 1775. Beaglehole, *The Life of Captain James Cook*, p. 126.

65. F. B. Sullivan, "The Naval Schoolmaster During the Eighteenth Century and the Early Nineteenth Century," *Mariner's Mirror* 62, no. 4 (November 1976).

66. Derek Howse, *Nevil Maskelyne, The Seaman's Astronomer* (Cambridge: Cambridge University Press, 1989), p. 120.

67. Ibid., p. 157.

astronomers, scientists, and interested professionals of other nations. How many of these volumes actually found their way onto the 9,355 merchant ships registered as British owned in 1788 (1,599 of them of over two hundred tons and almost certainly engaged in long passages) remains unknown, but obviously acceptance was less than universal.[68]

The lack of enthusiasm for lunar distance, understandable because of disadvantages mentioned earlier, might also be explained by a prevalence of chronometers had an abundance of them existed. Landes places total British production by 1815 at 4,000 to 5,000 instruments[69] and some production must have been absorbed through loss, breakage, non-maritime application, and redundancy.[70] Chronometers were by no means universal, and even in the Royal Navy official policy conspired to keep them from becoming so.

After captains, masters of Royal Naval vessels were the highest paid members of a ship's company, but they were responsible for providing their own instruments, charts, and reference materials as any tradesman would provide his own tools.[71] Their rates of pay varied according to the status of vessel, but in 1799 ranged from £9, 2s per month in a first rate to £4 in a sixth rate.[72] A quadrant of this period might cost £9 and be considered a reasonable investment for a quality instrument that would last a lifetime. But a chronometer would cost from £25 to £100 and need expensive periodic cleaning and rating.[73] French chronometers tended to be even more expensive.[74] In 1809, the navigation handbook issued by the Naval Council in Amsterdam devoted only two of six hundred pages to the chronometer, stating that although there were good instruments available, they were too expensive and too delicate to be practical.[75] It is highly likely that many naval masters shared the same opinion, since through the Napoleonic wars they were required by the articles only to perform a celestial observation at noon, which as always, determined latitude.[76] Finally, in 1825, chronometers were placed aboard HM vessels by general issue,[77] two decades after British naval supremacy had been firmly established in worldwide operations.

It might be argued that despite the scarcity of chronometers or practitioners of longitude by lunar distance, the existing ability to find longitude did have an effect on naval operations. Doubtless this is true, but an analysis of loss to wreck of HM ships-of-the-line during years of wartime operation, shown in Table 1 opposite, does not suggest that this effect is anywhere near as profound as common assumption warrants.

There are many causes for shipwreck that have nothing to do with faulty navigation, among them failure to weather a lee shore due to damage aloft, damage to steering gear, excessive bottom growth, or extraordinarily severe conditions. In addition, ships at anchor might drag or part cables and then drift down on other ships, or vessels might sometimes run ashore if they are making water so fast that their pumps cannot keep up. At Quiberon Bay and other places, ships were lost to wreck in the heat of action. Navigation may be faulty because cloud cover prevents observations. Since the ratios of loss shown in Table 1 indicate no dramatic improvement subsequent to the longitude found, they suggest that either longitude was not a major causal factor in shipwreck or that the advances were not significant until after the end of the Napoleonic Wars.[78]

68. Parry, *Trade and Dominion*, p. 206.

69. Landes, *Revolution in Time*, p. 184.

70. Vessels which carried more than one chronometer as a check tended to carry three, since the navigator could never be sure which one of a pair was in error.

71. In 1808, the Admiralty began to issue boxed portfolios of charts specific to the area of operations, relieving masters of this responsibility. Brian Lavery, *Nelson's Navy: The Ships, Men, and Organization 1793-1815* (London: Conway Maritime Press, Ltd., 1989), p. 182.

72. Dudley Pope, *Life in Nelson's Navy* (Annapolis, MD: Naval Institute Press, 1981), p. 84.

73. Landes, *Revolution in Time*, p. 184. I believe the instruments he considers at the lower end of this price scale are what would then have been termed deck watches, intended to be carried on one's person. These were not as accurate as full chronometers, their rate depending on constant ambient temperature caused by body warmth. As indicated by available examples, most Arnold and Earnshaw chronometers of this period seem to have run closer to the £100 mark.

To put the cost of a chronometer in perspective, Cook's ship in his first voyage, HMS *Endeavour*, was sold fully found on March 7, 1775 for £675 and in good enough condition to be used for many years thereafter in her former occupation, the coal trade. P. W. Brock, "Cook's *Endeavour* and Other Ships," *Mariner's Mirror* 54, no. 2 (May, 1968).

74. Landes, *Revolution in Time*, p. 184.

75. Ibid., p. 185. As his source, Landes cites C. A. Crommelin, "The Introduction of the Marine Chronometer into Naval and Mercantile Use," *Bulletin of the National Association of Watch and Clock Collectors* 4 (October, 1951): 406-407.

76. The captain, lieutenants, and midshipmen were also supposed to participate in this activity. The master entered the information in the log and the captain entered it in the journal. Lavery, *Nelson's Navy*, p. 202.

77. Gould, *The Marine Chronometer*, p. 131.

78. To compare eighteenth-century apples to twentieth-century oranges, a yearly loss ratio to accident during wartime operations of 1 percent does not look too bad for cutting edge naval technology. The loss to crash to the U. S. Navy of F-14 naval fighters currently stands at about six per year. Spread among twenty-six active squadrons of twelve aircraft each, this represents a loss ratio of 1.9 percent for peacetime operations. At $37,000,000 per aircraft, and using Landes's conversion factor of $250-£1 (late eighteenth century), operating ships-of-the-line during wartime was about fifteen times less risky in monetary terms. Figures from Norman Polmar, *The Ships and Aircraft of the U.S. Fleet* (Annapolis, MD: Naval Institute Press, 1987) and Archibald, *The Wooden Fighting Ship in the Royal Navy*.

Table 1

Period	Ships Lost to Wreck	Ships in Commission (Avg. over period)	Ships Lost Per Year	% Lost Per Year
1688-1714: Wars of English and Spanish Succession	23	129	.88	.68%
1718-1748: Spanish War of 1718, War of Jenkin's Ear	13	127	1.3	1.02%
1756-1763: Seven Years' War	6	154	.85	.55%
1775-1783: American Revolution	14	178	1.75	.98%
1793-1801: Revolutionary Wars, Part 1	13	186	1.62	.87%
1802-1825: Revolutionary Wars, Part 2	15	128	1.15	.89%

The figures are given for fourth rates and above (50+ guns). The table is compiled from information presented in various appendices of E.H.H. Archibald, *The Wooden Fighting Ship in the Royal Navy, AD 897-1860* (New York: Arco Publishing, 1986).

These advances do not seem to have played any role in the 1811 Baltic Fleet calamity, the worst maritime disaster to befall the British Navy since the loss of Sir Clowdisley Shovell. In that year the Baltic convoy of 129 sail, escorted by four ships-of-the-line and smaller vessels, had been held up in Hano until November due to unfavorable weather. Shortly after departure the fleet encountered a gale which caused much damage, and the ships were forced to regroup in Vingo Sound, near Gothenburg, to effect repairs. These were completed, though inadequately in the case of the flagship *St. George* (98), and the fleet put to sea once again only to encounter an even worse gale. The disabled *St. George* could not make way to weather and went ashore on the coast of Jutland. Her escort, *Defense* (74), refused to abandon her until too late and went ashore as well, both ships breaking up with enormous loss of life. Some days later *Hero* (74) went ashore near the Texel and also broke up. As in 1707, two thousand lives were lost among the naval vessels although most of the merchant fleet managed to come through. There is a question as to the navigational equipment or ability of these ships to determine their longitude, but among those who survived the gale, celestial observations of any kind could not be made until the aftermath of the storm.[79] The longitude found had not made any difference.

John Harrison was not the sole or final recipient of the award for a contribution to longitude. The board continued to operate until 1828 and ultimately dispersed more than £100,000 for research and development.[80] For half this sum the Admiralty could have provided a chronometer for every ship at sea larger than a sixth rate at any time to the end of the Napoleonic Wars. In 1789, the construction and fitting out of a British 74-gun ship-of-the-line cost £43,820, and a 36-gun frigate £19,070,[81] expensive assets against which to balance the insurance provided by a £100 chronometer. That chronometers were not routinely specified equipment until long after they might have been made generally available suggests that the want of longitude could not have been viewed as a primary cause of loss.

In the merchant service, where survival was ruled by cost analysis, navigational sophistication was often thought of as a frivolous luxury. Gould presents evidence that as late as the Napoleonic Wars it was not unusual for American ships to cross to Europe not only without

79. A. N. Ryan, "The Melancholy Fate of the Baltic Ships in 1811," *Mariner's Mirror* 50, no. 2 (May, 1964). Parry refers to this incident in *Trade and Dominion*, indicating that most of the naval vessels had chronometers, but Ryan, whom he cites as a source, makes no such assertion. In any event, it does not seem this could have made any difference, even in the case of *Hero*.

80. Kemp, *Oxford Companion*, p. 92.

81. Archibald, *The Wooden Fighting Ship in the Royal Navy*, Appendix 3, p. 144.

chronometers, but without sextants or charts.[82] In 1823, when Messrs. Bryant and Sturgis of Boston were informed by one of their captains that he had thought it expedient to purchase a chronometer for $250, they replied that he would have to cover the cost from his own pocket, adding, "Could we have anticipated that our instructions respecting economy would have been so totally disregarded, we would have sett fire to the ship rather than have her sent to sea."[83] Near the end of commercial sail in 1895, Captain Joshua Slocum found himself finishing preparations for what would be the first and most famous solo circumnavigation, and commented that:

> The want of a chronometer for the voyage was all that now worried me. In our newfangled notions of navigation it is supposed that a mariner cannot find his way without one; and I myself had drifted into this way of thinking. My old chronometer, a good one, had been long in disuse. It would cost fifteen dollars to clean and rate it! Fifteen dollars! For sufficient reasons I left the chronometer at home where the Dutchman left his anchor.[84]

There is no doubt that a fair number of the thousands of wrecks which occurred before the longitude was found can be attributed to faulty navigation, for certainly many ships have come to grief since then for the same reason. But a host of other dangers threatened sailing ships every moment they spent underway, and a common protection against many of them was sea room. Room to windward was a resource to be obtained and hoarded as insurance against the need to invest it in coping with damage or unforeseen developments; room to wear if the ship will not tack, room to club haul if the ship will not wear, room to get another anchor out, room to run off while replacing a sail or a topmast, or to lie to while repairing steering gear or riding out a gale. Almost no operation, from sailing with the tide to coming to anchor, was undertaken without consideration for room from danger to leeward taken into account, and once gained this investment was surrendered only reluctantly and piecemeal, upon making an approach to destination.[85] Sea room was a sailing ship's safety margin, and buried among the mix of considerations that determine its sufficiency was protection from error out of reckoning. Finding the longitude may have moderated one of these considerations, but without changing the others, it was not by itself likely to lead to expensive or fundamental changes in practice.

Several decades following the discovery of the longitude, however, the ships themselves changed. Improved design, diagonal framing, wire rigging, chain anchor rodes, steam propulsion, and numerous other maritime technological advances of the early to mid-nineteenth century endowed ships with greater capabilities to operate with impunity over a range of conditions formerly considered hazardous. In the name of expediency, margins of safety could be shaved in proportion to increased capability, and in working to closer tolerances, precise navigation became considerably more important. Captain Cook had thought half a degree of longitude "more than Sufficient for all Nautical purposes," and for a seaman bred to the hazardous demands of piloting in the Newcastle coal trade, it was. His counterparts half a century later, faced with the potential and the need to cut more closely, gradually turned from the ancient tools of intuitive perception to embrace those of mathematical precision. The finding of the longitude is traditionally portrayed as a development long overdue. Perhaps it was a development ahead of its time, an artifact of science come to life in an age of wizards.

82. An American vessel was seized and condemned in Christiana on the grounds that since she had no such equipment, she must have come illegally from the British isles. The other American shipmasters present protested that it was common practice to undertake such voyages without charts or sextants and that any seaman with common nautical knowledge could do so. Gould, *The Marine Chronometer*, p. 132.

83. Samuel Eliot Morison, *The Maritime History of Massachusetts* (Cambridge, MA: The Riverside Press, 1921), p. 116.

84. Joshua Slocum, *Sailing Alone Around the World* (New York: W. W. Norton and Company, 1984), p. 9.

85. These assertions come partially from personal experience at sea in square rig but may easily be substantiated by reference to any of several treatments of the subject, such as Darcy Lever, *Young Sea Officers Sheet Anchor*, 2d ed. (New York: Edward W. Sweetman Company, 1963), or John Harland, *Seamanship in the Age of Sail* (Annapolis, MD: Naval Institute Press, 1984).

Raymond E. Ashley is a lecturer for the history department at East Carolina University, where he is enrolled in the masters program in Maritime History and Underwater Archaeology. He holds a U. S. Coast Guard Masters License for mechanical, sail, and steam vessels. He has taught courses in celestial and coastwise navigation and has extensive experience in vessel construction, restoration, operation, and sail training.

Query and Response

Dear Editor:

I find it difficult to reconcile the following statements, all appearing in the Winter, 1991 issue of *The American Neptune* (vol. 51, no. 1), page 12:

> . . . The first iron-hulled warships in the world were two steam frigates built in Britain for Mexico in 1842.
>
> The world's first ironclads to see war service were those employed by the French in the Crimea.
>
> At the end of 1859 the French launched *La Gloire*, the first seagoing ironclad . . . The British responded with the *Warrior* . . . the first large seagoing, iron-hulled warship.

. . . when I compare each with the other and also with previous articles in *The American Neptune* 21, no. 1 (Winter, 1962): 216-217 and, latterly, 48, no. 2 (Spring, 1988): 96, namely:

> . . . *Montezuma* was wooden-hulled . . .
>
> . . . *Guadelupe*. She was the first iron steam warship . . .
>
> Built in 1843, the . . . USS *Michigan* was the United States Navy's first iron-hulled warship.

Can the author, Dr. Tucker, submit a statement concerning the service status of *Guadelupe* as to wartime?

Sincerely yours,
Robert L. Eberhardt, M.S., M.A.
San Diego, CA

Dr. Tucker responds:

I appreciate Robert Eberhardt's letter, and make the following response to it:

While the *Michigan*, built in 1843, predated both *La Gloire* and *Warrior*, she was an iron-hulled vessel rather than an ironclad (armored) ship. She was designed for service on the Great Lakes; the British and French ironclads were ocean-going vessels. Incidentally, *Michigan* had an amazing service life. She plied Lake Erie for eighty years until 1923, when she broke a connecting rod and sent a piston through the head. She was finally sold for scrap in 1949.

Eberhardt is correct in pointing out that *Montezuma* was not iron-hulled. I incorrectly identified both *Montezuma* and *Guadalupe* (or *Guadaloupe*), the two steam frigates built in England for Mexico in 1842, as iron vessels. *Guadalupe* was iron-hulled but not armored. It may be a matter of semantics, but the French floating batteries in the Crimean War were the first ironclad armored vessels to see war service.

Guadalupe was built by John Laird and was a paddle frigate displacing 788 tons. She was 175 feet in length, 30 feet in beam, and propelled by steam alone. Her engine was rated at 180 horsepower. Designed to operate in shoal waters, the *Guadalupe* drew just 10 feet. Her armament, as with most early steamers, was built around a few larger pivot guns: two 68-pounders. She also mounted four 12-pounders.

Both *Guadalupe* and *Montezuma* sailed for Mexico with English crews commanded by English officers. *Guadalupe*'s captain was Commander Edward P. Charlwood, RN. These two steamers were much more powerful than vessels in the Texan fleet; the heaviest guns aboard ships in the Texas Navy were 24-pounders. The Texan minister to Britain, Ashbel Smith, tried to prevent the vessels from sailing; he protested with the same arguments advanced by the U. S. Government against Confederate cruisers fitted out in English yards during the Civil War. Thus, *Guadalupe* and *Montezuma* foreshadowed the later *Alabama* claims.

During the 1843 Mexican campaign against Texas, the *Guadalupe* was frequently under fire and was hulled a number of times by 18- or 24-pounder shots. The holes were clean punctures, easily plugged, and there were few casualty-producing splinters. On May 16, the *Guadalupe* battled the pride of the Texas Navy, the 20-gun (eighteen 24-pounders and two 18s) ship *Austin*. The Texas vessel took seventeen hits, most of them 68-pounder projectiles from the *Guadalupe*. The *Austin*'s rigging was so badly cut up that she was forced to retire.

Guadalupe and *Montezuma* were never paid for. On the outbreak of war between the United States and Mexico in 1846, they were transferred to an English firm and sailed to Cuba.

For more information, readers should see James Phinney Baxter, *The Introduction of the Ironclad Warship* (Cambridge: Harvard University Press, 1933); D. K. Brown, *Before the Ironclad. Development of Ship Design, Propulsion and Armament in the Royal Navy, 1815-60* (Annapolis: Naval Institute Press, 1990); Donald L. Canney, *The Old Steam Navy. Frigates, Sloops, and Gunboats, 1815-1885* (Annapolis: Naval Institute Press, 1990); and Jim Dan Hill, *The Texas Navy* (Chicago: University of Chicago Press, 1937).

I hope this is of some help.

Sincerely,
Spencer C. Tucker
Fort Worth, TX

Editor's Note: The volume by D. K. Brown of which Professor Tucker speaks is reviewed on page 271 of this issue of The American Neptune. *The* Neptune *welcomes queries and/or comments from its readers about articles that appear in the journal. Such correspondence may be addressed to the Peabody Museum of Salem, or to Timothy J. Runyan, Department of History, Cleveland State University, Cleveland, OH 44115.*

News

Kemble Collection Now at Huntington Library

The Huntington Library has received the family and professional papers of John Haskell Kemble, former professor of history at Pomona College and longtime member of *The American Neptune*'s Editorial Advisory Board, who died February 19, 1990. The Huntington is also the beneficiary of Professor Kemble's maritime library of 5,000 books, his extensive file of periodicals, an enormous collection of promotional ephemera, several hundred nineteenth- and twentieth-century historic prints and posters, over 100 maritime paintings and sketches, and other documentary materials.

In his will, Jack Kemble also left to the Huntington an endowment of $1.2 million, to be used to promote the study of maritime history at the Library. Funds from this endowment will be used to make the Kemble Collection accessible to scholars, to purchase additional maritime material, and to bring maritime historians to the Huntington. The Collection is in the process of being organized and cataloged. For more information, contact Alan Jutzi, Curator of Rare Books, The Huntington Library, 1151 Oxford Road, San Marino, CA 91108.

Exeter and East Carolina Plan Cooperative Program

Dr. William N. Still, Jr., Director of the Maritime Studies Program at East Carolina University, reports the establishment of a cooperative program in maritime history between ECU and the University of Exeter in Devon, England. Beginning in the winter of 1992, the two universities will offer exchange programs for students and faculty. Discussions last fall between Still and Exeter professors Michael Duffy and Stephen Fisher led to the preliminary agreement, which Still hopes will mark the beginning of an international network of university exchange programs in maritime studies.

Good News for Historic Ship Replicas

According to the fall issue of *Sea History Gazette*, things are looking up for several historic ship replica projects. It appears that a pledge of funds from the Australian government has given new life to efforts to build a replica of Cook's *Endeavour* for Sydney's new maritime museum, while a dedicated group of volunteers in Washington State enabled a replica of Captain Robert Gray's 170-ton brigantine *Lady Washington* to undertake a cruise to thirty communities in Puget Sound last summer. The Lake Champlain Maritime Museum launched its replica of the 1776 gunboat *Philadelphia* in August, and the summer also saw the first voyages of the new *Susan Constant*. A grant from the Institute of Museum Services for a structural survey of the Lightship *Nantucket* will keep that project alive, while the town of Pictou in Nova Scotia plans a decade-long project to build a replica of the 85-foot *Hector*, a Dutch-built sailing vessel which brought Scottish immigrants to "New Scotland" in 1773.

Book Reviews

DAVID J. STARKEY, *British Privateering Enterprise in the Eighteenth Century*. Exeter Maritime Studies No. 4 (Exeter, Devon: University of Exeter Press, 1990). Cloth, 344 pages, black and white illustrations, index, tables, notes, 8 appendices, bibliography. ISBN 0-85989-312-x, £25.

CARL E. SWANSON, *Predators and Prizes: American Privateering and Imperial Warfare 1739-1748*. Studies in Maritime History. William N. Still, Jr., Series Editor (Columbia, SC: University of South Carolina Press, 1991). Cloth, vii-xvii + 299 pages, black and white illustrations, index, tables, notes, appendix, bibliography. ISBN 0-87249-720-8.

After years of avoiding privateering as a serious subject worthy of research, maritime historians have begun to recognize the value of this intermittent, but nonetheless significant, wartime activity. Two of the most thorough and thought-provoking books recently written on the topic address the activities of eighteenth-century privateers from quite different perspectives. David Starkey's impressive analysis of eighteenth-century British privateering provides a wonderful overview of what was the last golden age of privateering. In doing so, it also creates a perfect context for appreciating Carl Swanson's study of pre-Revolutionary American privateers between 1739 and 1748 in wars against Spain and France.

By the eighteenth century, privateering had become an internationally accepted adjunct to a nation's naval strategy. The organizational and legal issues had been resolved for the most part, so that the rules of commerce destruction by private armed vessels were at least understood, if not always respected. In examining the topic, both Starkey and Swanson focus on privateering as a commercial rather than military activity, undertaken by mercantile interests primarily for profit. Working from a variety of sources, both authors have amassed vast amounts of data concerning the legal and economic implications of hundreds of prize actions affecting thousands of ships, seamen, merchants, and communities on both sides of the Atlantic. Starkey and Swanson both acknowledge the importance of computerized data bases in enabling them to organize their material clearly and examine it using quantitative methodologies. The tables they are able to derive from manipulating their data contribute much to the overall picture of privateering operations of the period and prove how extensive a practice it actually was. It may well be that earlier researchers into privateering were discouraged by the sheer volume of information and the analysis required before they could undertake a meaningful study of private armed warfare.

British Privateering Enterprise in the Eighteenth Century chronicles the activities of British privateers and letters of marque through the five wars which disrupted the century, and provides a ground-breaking analysis of the character, scale, and significance of this activity to those British maritime communities which participated. The organization of literally thousands of records into a coherent and manageable overview of a century of privateering must be commended. Not only has Starkey assembled this important material for the first time, he has managed to present it in an easily read and understood manner. Starkey's first section on the character of privateering covers the legal ground relating to privateering and the risks and rewards involved in what was clearly a legally regulated business. The second part of the book deals with the scale of eighteenth-century British privateering and establishes the linkage between the regular activities of maritime mercantile communities and the "transitory" demands made on the same vessels, seamen, and merchants by privateering ventures during wartime. There are five chapters, each one covering a period of war between Britain and one or more foes. The periods dealt with are 1702-1712, 1718-1720, 1739-1748, 1756-1762, and 1777-1783. The chapter entitled "Good Pickings for Privateers of Force" examines the 1739-48 conflict and dovetails nicely with Swanson's work by providing the British perspective. The last part examines the significance of privateering from the standpoint of constraints, public versus private interests, and its overall importance.

Working within such a broad expanse of history has enabled Starkey to analyze his data in terms of "inputs" and "outputs" for each war to determine how privateering

evolved over the century. Roughly speaking, "inputs" are the number, tonnage, and crew needs of the privateers, and "outputs" are the prizes condemned in Admiralty Court, which was the judicial body responsible for determining whether captured ships were legal prize or not. Among the variables determining the size of both "inputs" and "outputs" were the size of the port of origin, the strength of the navy, and the nationality of the foe. For example, larger ports seemed to undertake major deep-water enterprises geared to capturing transatlantic trade, while Channel Island ports sent out small privateers to attack coastal commerce. The volume of privateering seemed to vary from war to war, although in general more privateers emerged when the Royal Navy was either weak or preoccupied. While this might have been an attempt at self-defiance, it might also have meant that there were more prizes available and, thus, higher stakes for which to play. One interesting fact Starkey notes in analyzing the significance of privateering is that the nationality of the foe generated a different reaction from would-be privateers. For example, there was always strong response when England went to war against the French, whereas activity against the Dutch was strong but brief, and against the Spanish, generally light. Starkey sees this not so much as a reflection of English prejudice but rather as an indication of under whose flag the best prizes were to be found.

Thanks to the numerous Admiralty Court records and related material still preserved, Starkey is able to create a fascinating profile of a little-known commercial activity war by war throughout the century. His use of some twenty-five tables, while occasionally distracting, is extremely helpful in tracing such factors as manning requirements, privateers sent out by different ports at different periods, and the number of prizes captured by private armed vessels versus naval ships. His research is meticulous and he is careful to indicate where his calculations are based on approximations and why. The end result is an excellently researched and written guide to eighteenth-century British privateering which sets new standards for academic achievement. The University of Exeter has made an important contribution to the literature of privateering.

The transition from Starkey to Swanson requires a transatlantic crossing and a tighter perspective. Carl Swanson's book, *Predators and Prizes: American Privateering and Imperial Warfare 1739-1748*, grew out of his doctoral thesis. In fact, part of the final chapter was published in *The American Neptune* in 1982 (vol. 42, no. 1 [January, 1982]: 36-56). In examining the role of eighteenth-century colonial privateers during the War of Jenkin's Ear and King George's War, Swanson argues (p. 21) that far from being a marginal activity, "privateering provided the basic maritime strategy of the wars of 1739-48."

Among the most useful primary documents for the study of British colonial privateering are Vice-Admiralty Court records, since virtually every capture constituted a legal case based on usually truthful affidavit evidence. Unfortunately, Swanson is hampered by the scarcity of intact Vice-Admiralty records for his period. Nevertheless, he mines a rich lode of historical information from an extensive study of colonial newspaper records. While such material has always been treated with healthy scepticism by historians, Swanson has carefully sifted through local press accounts to find the documentary evidence necessary to substantiate his claims. What is sometimes frustrating is the vagueness of certain newspaper reports which, for example, state that a prize was taken near a West Indian island, but fail to indicate which one. Such gaps in information make it hard for both the author and the reader to draw conclusions about the extent of privateer activity or its overall impact.

Predators and Prizes is organized by topic with seven chapters addressing such issues as the popularity of privateering as a manifestation of the mercantile spirit of the times, the legal and organizational aspects of privateering, the impact of privateering on trade, shipping and labor markets, the relative roles of American, French and Spanish privateers, and finally, the overall economic effects of privateering on an individual as well as on a national scale.

Although he refers to imperial warfare and discusses the Royal Navy's policy of static wages, smaller prize shares, and delayed payment of prize money as part of its failure to match either the successes or the appeal of privateering, Swanson writes from a predominantly colonial viewpoint. The prize actions he discusses were located mostly off American shores or in the Caribbean. Like Starkey, he perceives the crux of the conflict as trade not conquest (p. 3). American merchants, seamen, and entrepreneurs were willing to risk their lives, ships, and capital for a larger slice of Spanish and French colonial trade. Their patriotic support of Britain's political cause was secondary.

Predators and Prizes is well-designed and easily read. While Starkey's footnotes are placed at the end of each chapter, Swanson's are located at the end of the text. Although this makes for easier reading, it is more tedious for those who read footnotes regularly. The photographs are well-chosen, but Swanson's book would have had greater impact with more and larger illustrations.

Both Swanson and Starkey come to the conclusion that privateering was a viable and most likely lucrative activity for most of those who pursued it. However, it is illustrative of the transitory nature of privateering enterprise that neither can determine just how profitable privateering was. Nevertheless, both authors have taken the study of what was once a romanticized and misunderstood maritime activity and raised it to the level of historical scholarship. Specialists will find both books excellent studies of a little-known aspect of maritime history, and the general reader will enjoy meeting privateers as they really were, an important part of eighteenth-century seafaring life.

FAYE KERT

Ottawa, Ontario

D. K. BROWN, *Before the Ironclad: Development of Ship Design, Propulsion and Armament in the Royal Navy, 1815-60* (London: Conway Maritime Press, 1990). 217 pages, 12" x 10", cloth, introduction, appendices, bibliography, index. £30.00.

The Royal Navy of the decades between the Napoleonic Wars and the launching of the *Warrior* is usually depicted as resting on its laurels and hidebound in its resistance to the changes in ship construction and propulsion which would revolutionize naval warfare in the nineteenth century. David Brown, Head of Ship Design Policy for the British Admiralty, destroys that view in this volume. He shows that the Admiralty was receptive to new ideas, carefully evaluated the applicability of new technology to the navy, and adopted many more innovations than is usually thought.

Sir Robert Seppings, Master Shipwright (Director) at the Royal Dockyard at Chatham, laid the basis for scientific study of naval problems and inventions at the beginning of the century. Between 1810 and 1832, the School of Naval Architecture in Portsmouth produced a cadre of engineers who guided the revolution in steam propulsion, first by paddlewheels and then screw propellers, and the transition from wooden to iron hulls. Brown analyzes the development of each technology, describes the conversion of existing ships to steam power and the building of iron-hulled ships, and traces the evolution of the navy's administration and dockyards.

These technical developments met their first test of battle during the Crimean War. Brown analyzes operations, concluding that they proved that steamships were more reliable for being at a given place at a stated time than sailing vessels. In the Black Sea, iron ships showed they could successfully attack coastal fortifications, and the Battle of Sinope demonstrated that wooden ships were doomed by the development of exploding ordnance.

This heavily illustrated work closes with a chapter on the last wooden ships — the screw battleships, frigates, and smaller vessels built to counter the French during the 1850s — and one on the building of the *Warrior*, the Royal Navy's first ship to bring together the iron hull, the screw propeller, and armor.

Based on exhaustive research in primary and secondary sources, this volume is certain to become the standard work on technology and the Royal Navy during the early nineteenth century. Its publication nicely coincides with the appearance of *The Old Steam Navy*, Donald L. Canney's study of the U. S. Navy. (Volume one is entitled *Frigates, Sloops, and Gunboats, 1815-1885;* volume two on torpedo vessels and ironclads from 1842-1885 is in the works.) Together, the two achieve a new level of detailed and sophisticated study of the naval transition from sail to steam and from wood to iron.

JAMES C. BRADFORD

Texas A&M University

RONALD HOPE, *A New History of British Shipping* (London: John Murray Publishers, Ltd., 1990). xii + 533 pages. £35.00.

The sweep of Hope's *A New History of British Shipping* defies description, for the work embraces that long era from the time Britons saddled logs to the present circumstances of cross-Channel ferries. Between two covers is a rather complete history of the rise, growth, development, and decline of British shipping. Based on a wide range of secondary sources in books and periodicals, and resting equally on government reports and statistical information, this tour of the horizon is a significant achievement, undertaken by the former director of the Seafarers Education Service and the Marine Society. Dr. Hope is a trained economist and economic historian and has been a student of the merchant marine for over forty years. Recognized by his sovereign and country for his services to shipping, he has, with this book, also contributed an immense legacy to maritime history. His bibliography alone, though by no means complete, is suggestive of the past and contemporary writing that

makes the maritime history of Great Britain such a useful subject of inquiry.

For years it has been argued that the British Empire owed its existence to the seas. Britannia made Britain great, and the merchant marine was the main prop of British naval might in peace or in war. Navies are artificial creations of state; they do not evolve from the natural instincts of humanity, which are landed. Thus, navies must be direct creatures of the state and its financial power. The same is doubtless true of merchant marines. State regulation aids and abets, or restricts and limits, merchant development. Over four centuries or more, British governments were alive to the fact that their defense and their opulence depended on water transportation, in British waters and overseas. Thus, from the fitful Elizabethan enterprises, which had the crown's nominal assent, to the mid-twentieth century, British maritime policy was to encourage shipping. Under regulatory schemes and agreeable systems of encouragement, British shipping prospered and grew, and for years the volume and value of British shipping increased.

Then aggressive state policies of other powers — including France, Germany, Japan, and the United States — closed the gap, and Britain's relative margin over the others diminished. Until 1945, perhaps even afterward, Britannia was strong at sea. The Thatcher government completed the task of deregulating British seaborne prowess, and although British sailors continue to man ships under British registry, much of British trade by sea is now conducted by fleets under flags of convenience. Dr. Hope makes it clear that British regulations of safety, which he applauds, are not observed by all ships flying flags of convenience. Moreover, although he explains why British seamen deserved the wage raises their union was able to extract from employers by negotiation or strike, he is appreciative of the fact that high labor charges have been one of the reasons for chasing British seaborne commerce "off shore," as it were. British capital has gone where the building and purchase of hulls is cheaper too. The reader is treated to excellent examples of how steamship companies have engaged in takeovers and amalgamations, sometimes for tax purposes. One great real estate company, for example, bought a major steamship line for beneficial tax reasons.

The strength of this work lies in its comprehensiveness, but its political merit is its up-to-date perspective on the 1980s. Some readers would argue that the treatment of periods is perhaps too uneven. In the reviewer's opinion, Dr. Hope gives too much attention to the 1500s and not enough to the key 1700s. Moreover, the golden opportunity to describe and analyze the bountiful period of the nineteenth century is not taken up. This is counterbalanced, however, by the hard-hitting and clear-thinking perspectives of his twenty-fourth chapter, "Downhill All the Way (1973-1988)" and by his insightful epilogue, "The Great Debate." "We are a seafaring race and we understand the call of the sea," wrote Churchill during the Battle of the Atlantic, to which he added, in reference to the merchant marine, "We account you in these hard days worthy successors in a tradition of steadfast courage and high adventure, and we feel confident that the proud tradition of our island will be upheld wherever the ensign of a British merchantman is flown." Dr. Hope concludes his opus with the following poignant assessment of the past, present, and future:

> Less that fifty years later, the Red Ensign flies at the stern of fewer and fewer ships, ships which are seen in fewer and fewer ports, and the tradition lauded by the wartime Prime Minister is maintained by no more than 30,000 seafarers, one third of them probably at home, and a high proportion of the rest sailing to and fro across the English Channel and the North Sea. Four hundred years ago the Lord Treasurer of Queen Elizabeth I declared that one small sailing vessel brought in from the Continent as much in one year as ten large merchant ships brought from other places in two years. His modern counterpart in the service of Queen Elizabeth II might make a similar claim for the ro-ro [roll-on, roll-off vessel] in relation to ten container ships engaged in world-wide service. But history will not otherwise repeat itself, for British oceanic shipping will not rise again.

BARRY M. GOUGH

Wilfred Laurier University
Waterloo, Ontario

ARTHUR J. MARDER, MARK JACOBSEN, AND JOHN HORSFIELD, *Old Friends, New Enemies: The Royal Navy and the Imperial Japanese Navy. Volume 2, The Pacific War, 1942-1945* (New York: Oxford University Press, 1990). xxx + 621 pages, illustrations, maps, appendices, index. ISBN 0-19-820150-8. $69.00.

"Too little, too late. The story of the Royal Navy in the Pacific," (p. 525) conclude the authors of this two-volume set, which began at the year 1936. By contrast, the late Arthur Marder and his two former graduate students Mark Jacobsen and John Horsfield made this volume too long, too redundant and detailed, and too expensive. Marder wrote less than a third of the text before his

passing in 1980, covering the end of the Japanese offensives in April 1942, but he set the style for his successors.

Inevitably, a third party to the British and Japanese navies intrudes so much into the story that it finally dominates: the United States Navy. This treatment of Anglo-American naval relations in the Pacific war is definitive, from overall strategy — proposed and actual — down to logistics and especially personalities. U. S. Admiral Ernest J. King found equal matches in British Admirals Andrew Cunningham and James Somerville, but not as "the die-hard Anglophobe of reputation, only a die-hard proponent of the U. S. Navy," jealous of the Royal Navy (p. 196), so much so that he likened its integration into the U. S. Pacific Fleet to "incest" (p. 355). Both King and General Douglas MacArthur alternated between wanting and rejecting the new British Pacific Fleet's support in 1945.

Old Friends, New Enemies is richest in character sketches of leaders of the three navies, based on Marder's oral interviews in the 1970s and correspondence with former key staff officers by the authors. Somerville emerges as the clear favorite — "a born commander," "a very attractive and charming man and a ball of fire with a tender heart," and absolutely fearless (pp. 100-101) — who fended off Winston Churchill's unreasonable demands for offensive actions from his under-strength, poorly trained, and demoralized Eastern Fleet based at Mombasa during 1942-43 and at Colombo, Ceylon thereafter. For Somerville could only use his ships for trade protection as a "'fleet in being,' not simply to deter the Japanese but as a force that would eventually share in Japan's defeat" (p. 179). Even at that, however, he eschewed unescorted convoys in the Indian Ocean where German and Japanese submarines scored occasional successes, like sinking one troopship which cost the lives of one thousand British servicewomen. And in 1943-44, Somerville had to endure the "fuss and blah" — as Vinegar Joe Stilwell put it (p. 272) — of endless, useless meetings convened by new theater commander, Admiral Louis Mountbatten. With Somerville in mind, incidentally but tellingly, Churchill dismissed admirals as unqualified for the highest policy posts because (echoing Pericles) "they have very rarely the time or opportunity to study military history and the art of war in general" (p. 233n).

In the end, the British Pacific Fleet did get into the last Pacific campaign, Okinawa, but could never overcome seriously deficient long-legged logistics: the Fleet Train's inability to refuel and replenish ammunition while underway, insufficient supply ships due partly to Australian dockyard strikes, and inadequate health and dietary precautions at steamy Manus, where polio and food riots plagued certain warships. As victory neared, the role of the Americans became overwhelming, leading the authors to divert their attention from the British to long accounts of American actions, such as the sinking of the battleship *Yamoto*, in which the Royal Navy played no role at all! Voluminous details of Japanese politics are also superfluous for this particular book, whereas the few combat accounts, such as the sinking of the cruiser *Haguro* in May 1945, are excellent and necessary.

Perhaps due to the peculiarities of British historical writing, but the book is marred by many quirks: dozens of long direct quotations instead of tight paraphrasing, citing of only direct quotations rather than all information, the "kitchen sink" digressions — that is, throwing in nearly everything just for a good story, such as an account of the demise of British First Sea Lord Admiral Dudley Pound. On key secondary sources, one wonders if, in fact, the authors really consulted Samuel Eliot Morison's and Stephen Roskill's multi-volume histories of the naval war when the only citations are of their one-volume summary accounts. Knowing the Marder-Roskill feud of their later years, there is every suspicion that the use of that superb historian's works was, regrettably, minimal.

CLARK G. REYNOLDS

College of Charleston

CHARLES H. TURNBULL, *The Last Voyage of the* Jean F. Anderson (Mystic, Connecticut: Mystic Seaport Museum, Inc., 1990). 6" x 9", paper, 104 pages, 15 illustrations and diagrams. $13.95.

This little book is a valuable addition to the history of the coasting schooners.

Like many young men back in the days when several schooners were still carrying lumber and other cargo from the Maritime Provinces to cities along the U. S. coast, Turnbull signed on the tern *Jean F. Anderson* for a summer job which would end in time for him to return to college in the fall. His experience in the summer of 1941 took him from Nova Scotia to New York and then on to Jacksonville, Florida, where he left the ship. He missed the critical part of the journey when, some weeks later, the *Anderson* was destroyed by a hurricane as she plowed along to Bermuda.

Turnbull was young, intelligent, and eager to work hard and learn all he could about a commercial sailing vessel. He was a serious observer of life at sea. Now, fifty

years later, he gives us a very detailed report on what he saw, how the ship sailed, and how a group of sailors pulled together to make it all work. Some of the details are minor, but some are of major importance, such as a detailed study of coming about, which he describes as a "noisy process" as the boom tackles and the sheet blocks rattled as the booms moved over.

The *Jean F. Anderson* was a well-known tern schooner that had been owned by Captain J. L. Publicover, the Nova Scotia operator of many sailing ships. He had sold the *Anderson* to a Jamaican in 1941 for $15,000, which, according to Giles Tod, was "a good price for a twenty-two-year-old schooner built of softwood." The new owner apparently planned to put power in her, because two diesel engines were loaded before the lumber cargo went aboard.

Turnbull left the ship in Florida. The schooner took on a load of hard pine destined for a U. S. base in Bermuda. About a month later, 150 miles from Bermuda, she was hit by a hurricane for nearly a week. Her crew survived for twenty days before being picked up by a British freighter.

What happened to the *Jean F. Anderson* was a fate many a schooner faced. The ships were tired and old. They needed thousands of dollars worth of repair work to tighten and strengthen their hulls. Once they hit a serious storm, they fell apart.

Turnbull's book is a good one to put alongside Giles Tod's *The Last Sail Down East* and Art Hansen's *Photographic Memories of a T Wharfer*. To those of us who had a chance to sail in one of the schooners as they slowly died out as a transportation facility (my experiences were on the famed old *Minas Prince*) the book brings back a nostalgic look at an era that now seems to be light years back.

JOHN R. HERBERT

Spring Hill, Florida

JOHN LAMBERT AND AL ROSS, *Allied Coastal Forces of World War II. Volume 1, Fairmile Designs and U. S. Submarine Chasers* (London: Conway Maritime Press, 1990). 256 pages, illustrations, drawings, appendices, bibliography. £35.00.

This first of a projected three volumes details the craft designed by the Fairmile Marine Company of Cobham, Surrey. Assembled from prefabricated kits in shipyards throughout the U. K., the B-Type Motor Launch proved particularly versatile. This 112-foot craft, displacing from sixty-five to eighty-five tons, was powered by two Hall-Scott Defender 600 HP gasoline engines. It could generate a speed of twenty knots, and had a range of 1,500 miles. Armament varied with the craft's function, and included a 3-pounder Mk I, two .303-inch Lewis guns, depth charges, and both single and twin 20mm Oerlikons. Some were adapted for minelaying. The crew normally consisted of two officers, two petty officers, and twelve to fourteen ratings.

The volume is lavishly illustrated with photographs and drawings, many exceptionally detailed. The construction lists of each type of Fairmile craft show where and when each vessel was constructed, by which yard, and its ultimate fate. This last category makes interesting reading. ML 127 was mined in the Thames estuary. ML 130 was sunk off Malta on 7 May 1942 by gunfire from E-boats. ML 169 burned at Gibraltar on 15 February 1942 — her loss due to an internal explosion. ML 267, in the service of the French, was lost on 28 March 1942 in the aftermath of the raid on St. Nazaire. ML 311 was sunk by Japanese forces in the Banka Strait on 14 February 1942. Some B-Type patrol craft, built in Canadian yards, saw service in the United States Navy off the East Coast in 1942 — a modest reverse form of Lend Lease. Although not designed for a long life, some of those which survived the war were converted to civilian use as private yachts or passenger ferries.

This volume not only covers the various Fairmile classes — motor launches, gunboats, torpedo boats, and landing craft (Infantry) — but the 72-foot diesel-powered motor launch and the U. S. Navy's 497 sub chaser as well. It contains sections detailing the equipment and armament — radar, depth charges, engines, smoke floats, rocket flares — to name only a few of the categories. Among the more esoteric forms of armament were the Holman projector and the parachute and cable (PAC) rocket. Both were designed to bring down hostile low-flying aircraft. Whether either ever did so is problematical. The Holman projector, which threw explosive charges into the path of the aircraft, could also lob potatoes or canned goods in the direction of rival ships and crews during altercations in port. As might be imagined, these small craft tended, like corvettes, to be "wet" in any kind of sea. One sympathizes with the captain who had his boots filled with hot water before setting out, on the not unreasonable theory that if his feet were going to be wet, they might as well be warm.

RICHARD W. TURK

Allegheny College
Meadville, Pennsylvania

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Dates in parentheses after the names of vessels indicate either the year of building (if not in italics) or the year of the reference (if in italics). Vessels having compound names are indexed under the initial letter of the *first* word. A list of vessels having compound names, arranged alphabetically by last names, follows the index. This index was prepared by Mrs. Geraldine M. Ayers of the Peabody Museum staff.

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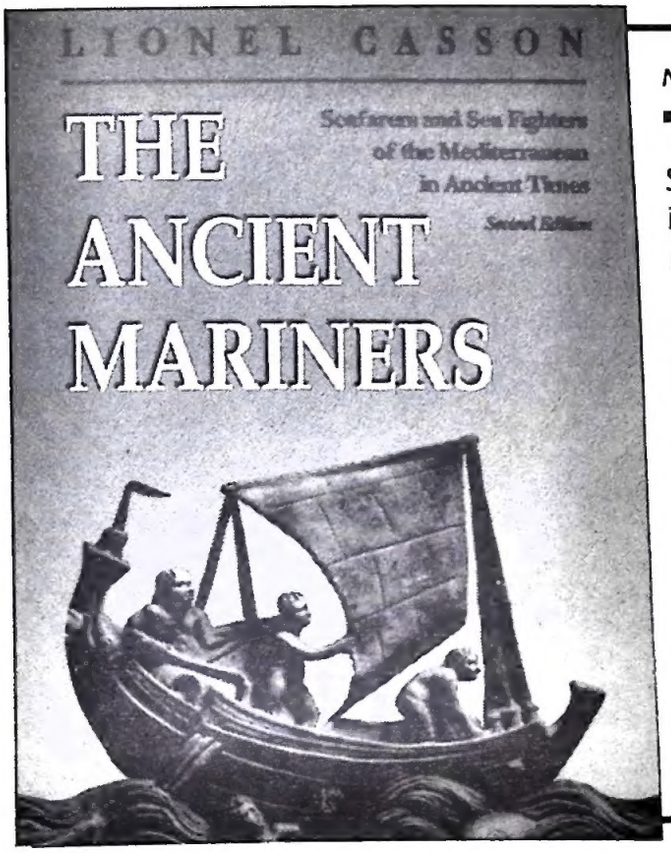

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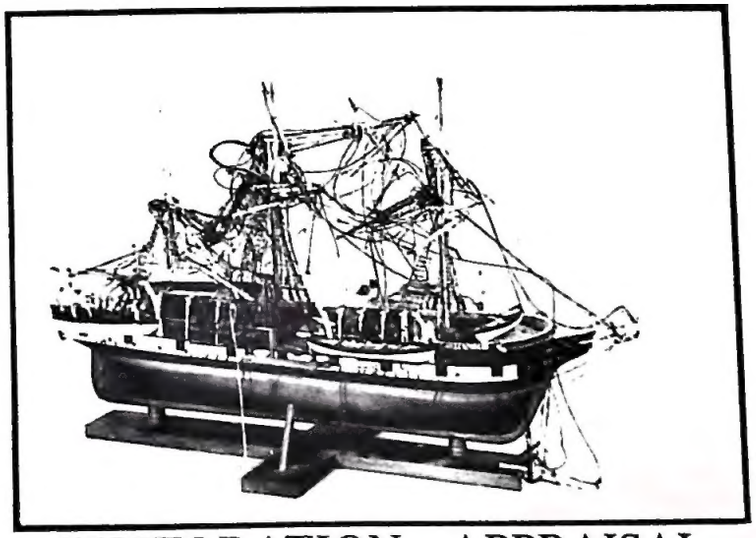

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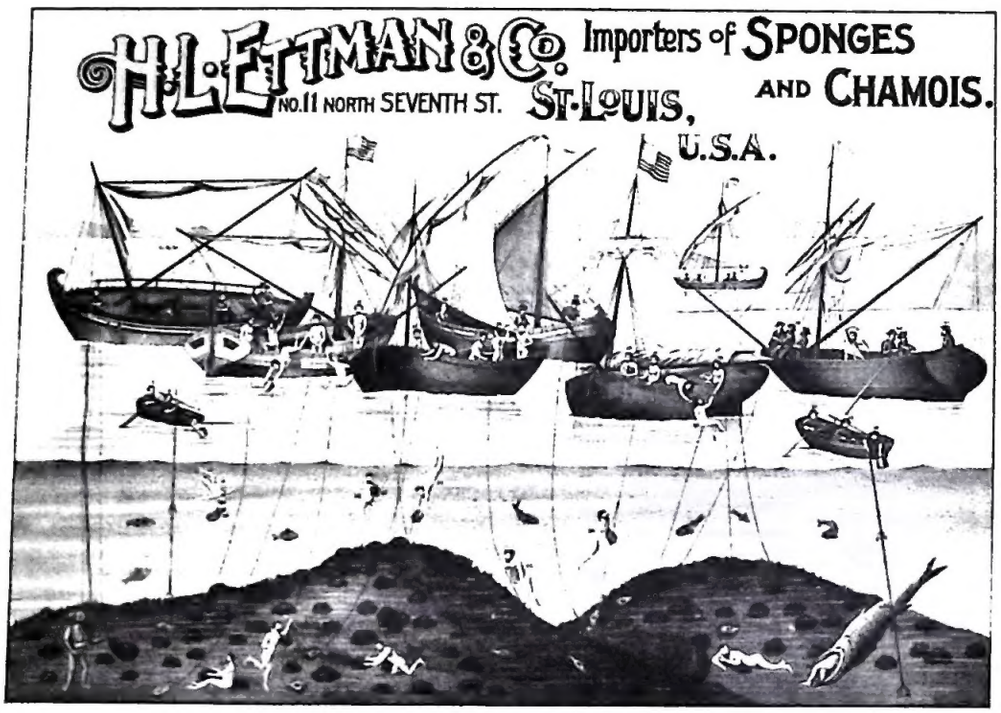

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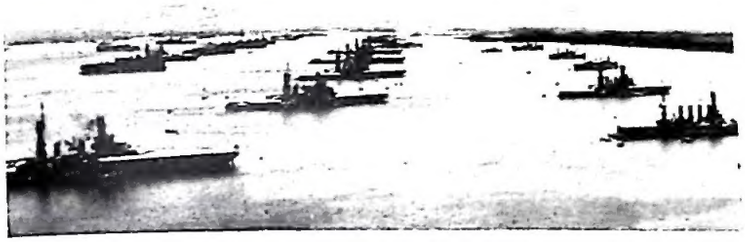

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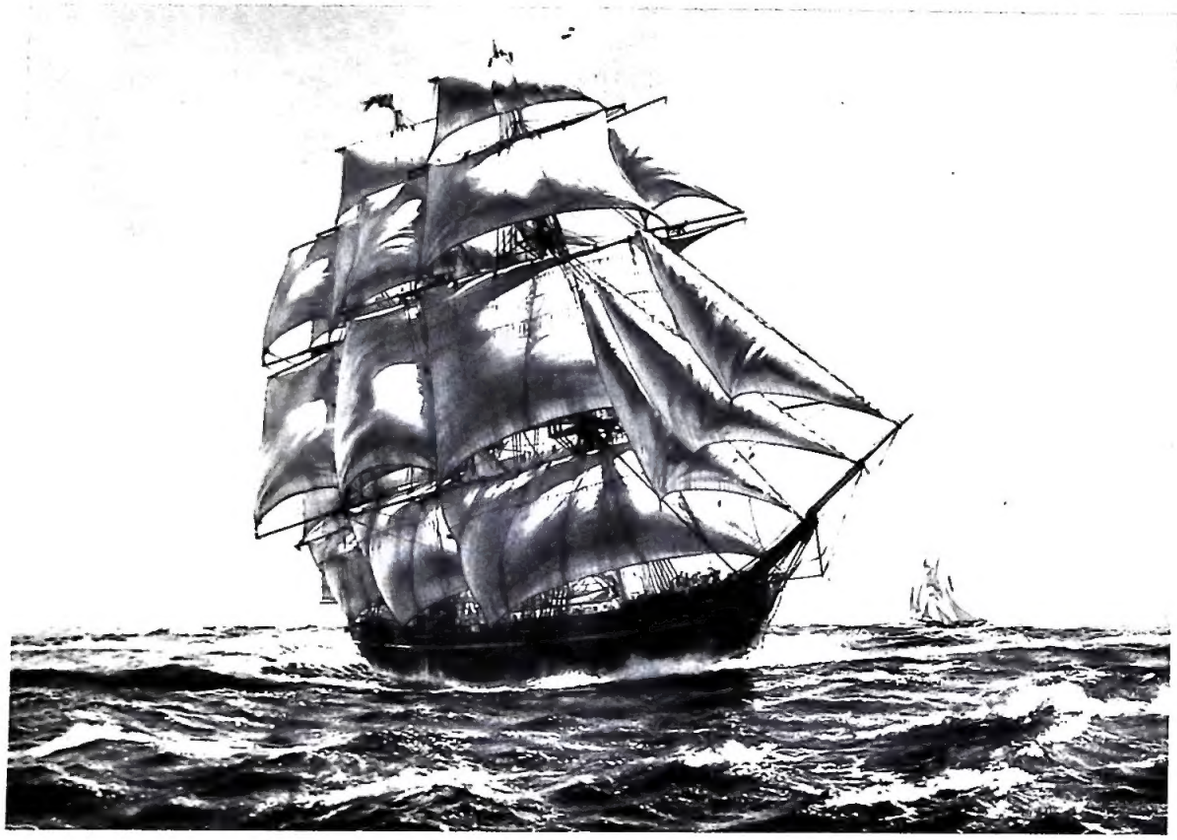

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